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A cross-sectional study of dentine hypersensitivity and predisposing factors at King Chulalongkorn Memorial Hospital, Thailand: A pilot study

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- Background** : *The study of dentine hypersensitivity and predisposing factors may help decrease dentine hypersensitivity and support treatments in patients.*
- Objectives** : *To investigate possible factors of dentine hypersensitivity among Thai patients visiting King Chulalongkorn Memorial Hospital.*
- Design** : *A cross-sectional descriptive study.*
- Setting** : *King Chulalongkorn Memorial Hospital, Bangkok, Thailand.*
- Materials and Methods** : *Sixty-eight patients were recruited and evaluated to confirm that they were suffering from dentine hypersensitivity due to gingival recession or cervical erosion. Patients with hypersensitivity from other factors were excluded. Hypersensitivity was measured by using cold water and tactile stimuli and a visual analog scale (VAS). Accepted VAS score was 3 to 10. Details of each patient were collected via a questionnaire. Patients were also measured any buccal gingival recession. Data were analyzed by descriptive statistics.*

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- Results** : *Subjects' ages ranged from 26 to 70 years (mean \pm SD = 45.9 \pm 9.5). The highest number of patients with dentine hypersensitivity belonged to the group of 41 - 50 years. Females elicited a higher prevalence of dentine hypersensitive teeth. Most sensitive teeth were the premolars and first molars. Overall mean of sensitive teeth per patient was 4.1. Mode of duration belonged to the 0 - 0.5 year group. Mean amount of gingival recession was 1.3 mm. Major stimuli causing hypersensitivity were cold drinks, sour food, and improper tooth brushing. The least cause was hot drinks. High fiber food, sour food, and sour fruit were most associated with sensitive teeth, and to a lesser extent were hard food and sticky food. Improper tooth brushing methods (scrubbing, up and down brushing) were also related to dentine hypersensitivity. We found statistically significant relationship between VAS score and the sour food. No statistically significant relationship between VAS score and food type or brushing method were found.*
- Conclusion** : *Most patients with dentine hypersensitivity were 41 - 50 years old. The premolars and molars are the most sensitive teeth to stimuli. The presence and history of dentine hypersensitivity are associated with patients' diet and tooth brushing method.*
- Keywords** : *Dentine hypersensitivity, visual analog scale, gingival recession, tooth brushing method, dietary consumption.*

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ธนิตา ณรงค์เดช, รังสิมา สกุลณะมรรคา, กิตติพงษ์ ดนุไทย. การศึกษานำร่องภาวะเนื้อฟันไวเกิน และปัจจัยที่เกี่ยวข้องกับภาวะเนื้อฟันไวเกินในผู้ป่วยที่มาใช้บริการในโรงพยาบาลจุฬาลงกรณ์ ประเทศไทย. จุฬาลงกรณ์เวชสาร 2556 มี.ค. - เม.ย.; 57(2): 175 - 86

- เหตุผลของการทำวิจัย** : การศึกษาเกี่ยวกับอาการเสียวฟันจากภาวะเนื้อฟันไวเกินและปัจจัยที่เกี่ยวข้องอาจมีส่วนช่วยลดอาการเสียวฟัน และช่วยในการรักษาผู้ป่วยได้ต่อไปในอนาคต
- วัตถุประสงค์** : เพื่อศึกษาภาวะเนื้อฟันไวเกิน และปัจจัยที่เกี่ยวข้องในผู้ป่วยเสียวฟันที่มาใช้บริการในฝ่ายทันตกรรม โรงพยาบาลจุฬาลงกรณ์
- รูปแบบการวิจัย** : การศึกษาวิจัยเชิงพรรณนา ณ จุดเวลาใดเวลาหนึ่ง
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- ตัวอย่างและวิธีการศึกษา** : ผู้ป่วยเสียวฟันจากภาวะเนื้อฟันไวเกิน จำนวน 68 ราย ที่มีสาเหตุจากเหงือกกรันหรือมีการสึกของฟันเท่านั้น อาการเสียวฟันของผู้เข้าร่วมวิจัยถูกตรวจโดยการใช้น้ำเย็นและการเขี่ยสัมผัสและวัดระดับความเสียวฟัน โดยใช้มาตราวัดระดับความเสียวฟัน (VAS) ซึ่งยอมรับที่ระดับ 3 ถึง 10 ผู้เข้าร่วมวิจัยที่ผ่านเกณฑ์จะต้องตอบแบบสอบถาม และถูกวัดระดับการร่นของเหงือกทางด้านกระพุ้งแก้ม ข้อมูลที่รวบรวมได้ถูกวิเคราะห์ทางสถิติโดยใช้สถิติเชิงพรรณนา
- ผลการศึกษา** : พบว่าผู้ป่วยเสียวฟันจากภาวะเนื้อฟันไวเกินที่มาเข้าร่วมการวิจัยมีอายุระหว่าง 26 ถึง 70 ปี ค่าเฉลี่ยอยู่ที่ 45.9 ± 9.5 ปี กลุ่มผู้ป่วยส่วนใหญ่มีอายุระหว่าง 41 ถึง 50 ปี ผู้ป่วยส่วนใหญ่เป็นผู้หญิง และพบอาการเสียวฟันสูงสุดในฟันกรามน้อยและฟันกรามใหญ่ซี่แรก จำนวนซี่ฟันที่มีอาการเสียวฟันเฉลี่ยในผู้ป่วยแต่ละคนอยู่ที่ 4.1 ซี่ ส่วนใหญ่ผู้ป่วยมีอาการเสียวฟันมานาน 0.5 ปี ค่าเฉลี่ยของระดับการร่นของเหงือกอยู่ที่ 1.3 มิลลิเมตร สาเหตุส่วนใหญ่ของอาการเสียวฟันมาจากน้ำเย็น อาหารและเครื่องดื่มที่มีรสเปรี้ยว การแปรงฟันที่ผิดวิธี ส่วนเครื่องดื่มร้อนเกี่ยวข้องน้อยที่สุด ในส่วนของชนิดอาหารพบว่าอาหารที่มีกากใยมาก อาหารและผลไม้รสเปรี้ยว เกี่ยวข้องกับอาการเสียวฟันมากที่สุด ส่วนอาหารแข็งและเหนียวเกี่ยวข้องรองลงมา พบว่าผู้ป่วยเสียวฟันส่วนใหญ่มีการแปรงฟันที่ผิดวิธี ความสัมพันธ์ระหว่างระดับความเสียวฟัน (VAS) กับชนิดของอาหารรสเปรี้ยว พบว่ามีนัยสำคัญทางสถิติ ส่วนอาหารชนิดอื่นและวิธีการแปรงฟันไม่พบว่ามีความสัมพันธ์กับระดับความเสียวฟัน (VAS) อย่างมีนัยสำคัญทางสถิติ

- สรุป** : การศึกษาในครั้งนี้ พบว่าผู้ป่วยเสียชีวิตจากภาวะเนื้อฟันไวเกิน ส่วนใหญ่มีอายุระหว่าง 41 ถึง 50 ปี และพบอาการมากสุดใน ฟันกรามน้อยและฟันกรามใหญ่ ชนิดของอาหารที่ผู้ป่วยรับประทาน และการแปรงฟันมีความเกี่ยวข้องกับอาการเสียชีวิตของผู้ป่วย
- คำสำคัญ** : ภาวะเนื้อฟันไวเกิน, ระดับความเสียวฟัน, เหงือกกรน, วิธีการแปรงฟัน, ชนิดอาหาร

Dentine hypersensitivity is considered as pain due to cervical dentine exposure and may occur through the loss of covering enamel or gingival recession with concomitant loss of cementum. Dentine hypersensitivity may disappear in a short time or persist for years. Dentine exposure can occur as a result of trauma, gingival recession, or from various restorative procedures.⁽¹⁾ Dentine hypersensitivity is a common problem mostly found in adult population with a prevalence of 25.5%.^(2,3) Various factors contribute to opening of dentinal tubules at the surface. Data on the distribution of dentine hypersensitivity in the patients' mouth imply the importance of tooth brushing method as determined by the sites of hypersensitivity.⁽⁴⁾ Other possible factors which contribute to the opening of dentinal tubules are erosive foods and drinks, age, the presence of periodontal disease, or cyclic loading fatigue of the thin enamel near the cemento-enamel junction.^(5,6) Based on the hypersensitivity theory, stimulus transmission across dentine elicits pain by fluid movement in the dentinal tubules.⁽⁷⁾ Consequently, occlusion of the tubules has been shown to reduce the fluid flow in dentine *in vitro*.⁽⁸⁾ The treatments of dentinal hypersensitivity are carried out by occluding the dentinal tubules or depolarizing the nerve synapses. However, most treatments have relatively short-term results.⁽⁹⁾

Previous studies^(2,3,10) were carried out using patient questionnaire with clinical examination. Their study showed that the prevalence of dentine hypersensitivity was the greatest number in 50 - 59 year age group.^(2,3) The premolars and molars were the most common sensitive teeth to the air and probe stimuli, while the incisors were the least sensitive ones. The presence and history of dentine hypersensitivity were also found to be positively correlated with

improper tooth brushing method and periodontal disease.^(2,10)

The aim of this study was to investigate the possible factors for dentine hypersensitivity among Thai patients visiting dental department of King Chulalongkorn Memorial Hospital, Thailand.

Materials and Methods

In this study, patients were recruited from those visiting dental department of King Chulalongkorn Memorial Hospital, Thailand. A total of 68 Thai patients were eligible for this study. Patients were clinically evaluated to confirm that they suffered from dentine hypersensitivity due to gingival recession or cervical erosion. Teeth with cracked enamel, caries, defective restorations, crowns, orthodontic appliances, or used as abutments were excluded from the study. In addition, patients with chronic diseases, oral manifestations of active infectious diseases such as hepatitis, HIV, or tuberculosis, and females who were pregnant or lactating were also excluded.

Each patient was given a questionnaire with subsequent clinical examination to evaluate the presence of cervical dentine hypersensitivity. Both cold water and tactile stimuli were used to cause dentine hypersensitivity. Hypersensitivity was measured using a visual analog scale (VAS) ranging from 0 to 10, with 0 representing pain free and 10 representing severe pain and discomfort. Patients with VAS score more than 6 were classified as severe hypersensitive group, while those with VAS score 6 and less were classified as mild to moderate hypersensitive group. The time interval between each measurement on a given tooth was at least 5 minutes. For this study, the accepted VAS score was 3 to 10.

Patients and their characteristics such as age, gender, educational status, smoking habit, daily food and drinks, teeth affected, factors initiating hypersensitivity, duration of hypersensitivity, oral hygienic habits, and behavior after acidic food or drink intake were obtained from the questionnaire.

In addition, the patients were also examined to measure any buccal gingival recession associated with the hypersensitive teeth. Measurements were made using a periodontal probe from the cemento-enamel junction to the free gingival margin.

The study period was 2 months. All patients were interviewed and examined by the same investigator. This study was approved by the faculty of Medicine, Chulalongkorn University. Data were analyzed using descriptive statistics such as frequency, percentage, mean, standard deviation, prevalence, and binomial test.

Results

A total of 68 patients were examined. Their ages ranged from 26 to 70 years with mean \pm SD = 45.9 ± 9.5 . The mode of dentine hypersensitivity belonged to the group of 41 - 50 years old. There were 64 females (94.1%) and 4 males (5.9%). The mean age of the females was 44.9 years while that of the males was 44.3 years. Dentine hypersensitivity demonstrated a predilection for women than men.

From the intra-oral examination, The premolars (47.1%) and first molars (22.1 %) were the most affected teeth. The incisors (10.3 %) were the least sensitive ones. The overall mean number of sensitive teeth per patient was 4.1.

With regard to gingival recession associated with the sensitive teeth, the buccal gingival recession ranged from 1mm to 5mm. The mean buccal gingival

recession was 1.3 mm. The mode of buccal gingival recession of 1 mm. was found in 51 patients (75.0 %). The duration of dentine hypersensitivity in this study ranged from 1 month to 10 years with the mode of duration of 0 - 0.5 year.

The major stimuli which caused dentine hypersensitivity are shown in Figure 1. Cold drink was the most common cause of dentine hypersensitivity accounting for 94.1% of all patients, whereas hot drinks caused the least dentine hypersensitivity accounting for only 8.8% of all patients.

It is therefore interesting to know the type of food associated with sensitive teeth. As shown in Figure 2, high fiber food, sour food, and sour fruits were associated with sensitive teeth in 45 patients (66.2%), 42 patients (61.8%), and 37 patients (54.4%) respectively; to a lesser extent, hard food with 24 patients (35.3%) and sticky food with 17 patients (25.0%).

The types of drink associated with dentine-sensitive patients are shown in Figure 3. Fruit juice was associated with the highest numbers of patients with hypersensitivity (75.0%) followed by fermented milk (70.0%), while energy drink was the least associated with hypersensitivity (3.3%). When dentine hypersensitive patients were segregated at the cut off VAS of 6 into severely hypersensitive patient (VAS >6) and mild to moderate hypersensitive patient (VAS \leq 6), the former group avoided sour food more than the latter as shown in Figure 4 (p -value = 0.05).

Most patients (78.3%) brushed twice a day. The medium-bristled toothbrush and soft-bristled toothbrush were used 56.7% and 38.3% respectively. The least (5.0%) used hard-bristled toothbrush, and no one used the electric toothbrush.

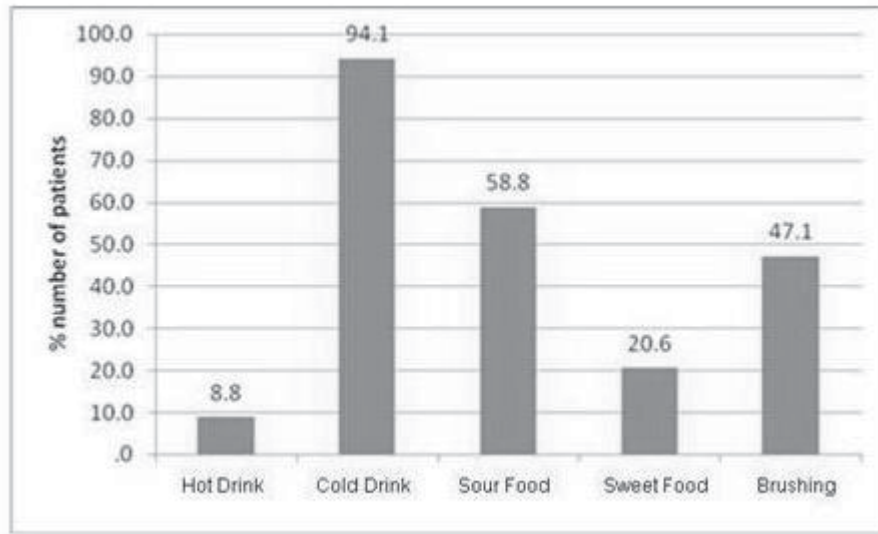


Figure 1. Initiating factor for dentine hypersensitivity.

Some patients with dentine hypersensitivity experienced pain from more than one type of stimuli.

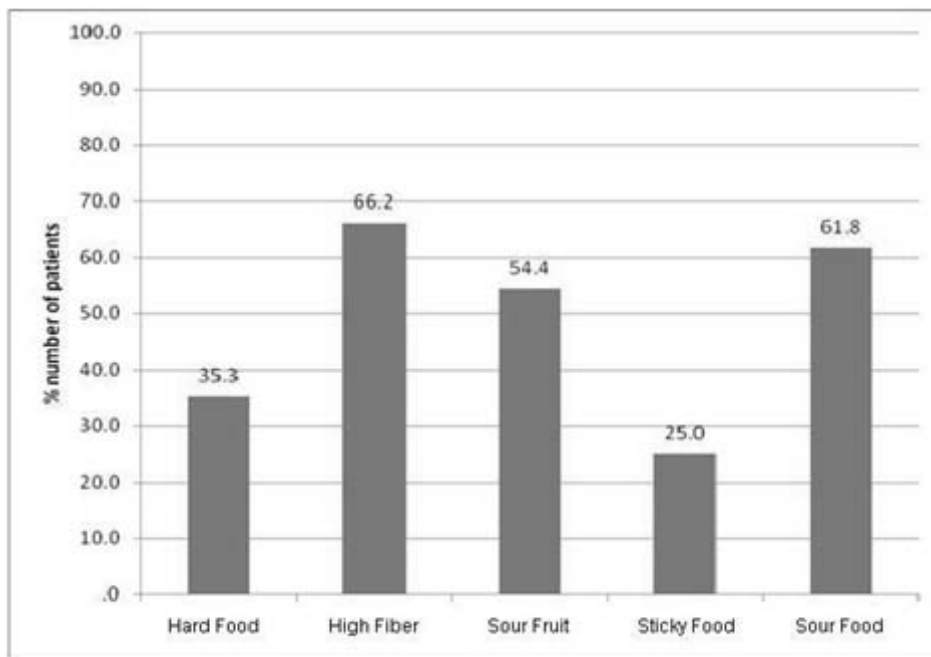


Figure 2. Type of food associated with dentine hypersensitivity.

Some patients with dentine hypersensitivity experienced pain from more than one type of dietary intake.

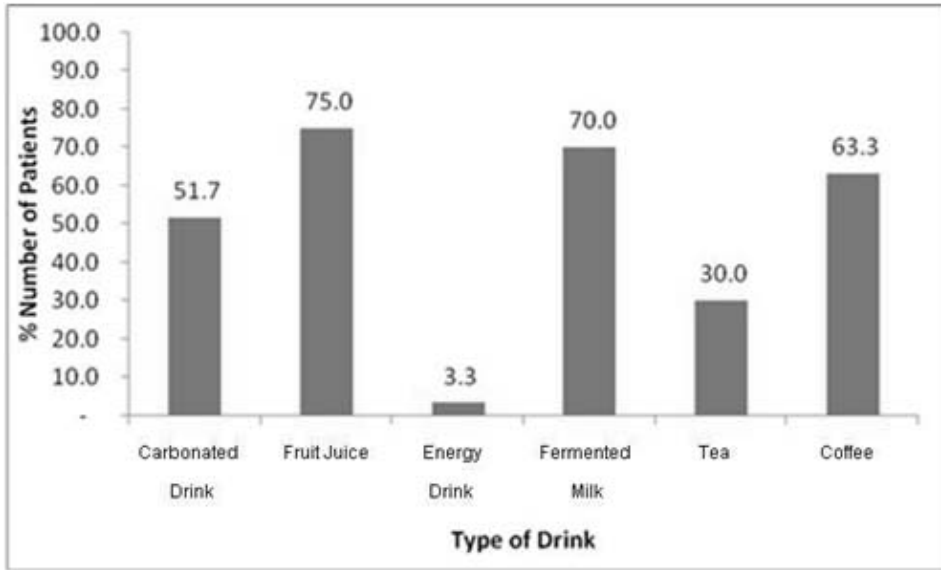


Figure 3. Type of drink associated with dentine hypersensitivity. Some patients with dentine hypersensitivity experienced pain from more than one type of drink.

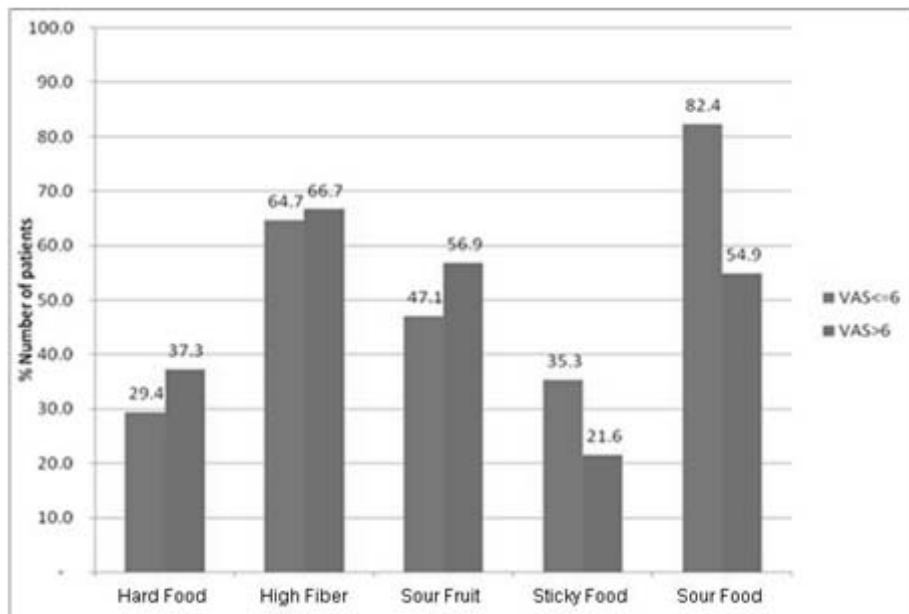


Figure 4. Type of food associated with dentin hypersensitive patient at cut off VAS of 6.

As shown in Figure 5, Improper brushing methods (scrubbing, up and down) were related to patients with dentine hypersensitivity.

their mouths with water after acidic food or drink intake. Others brushed their teeth immediately or did nothing after food or drink.

Figure 6 showed the behaviors of patients after acidic food or drink intake. Most patients rinsed

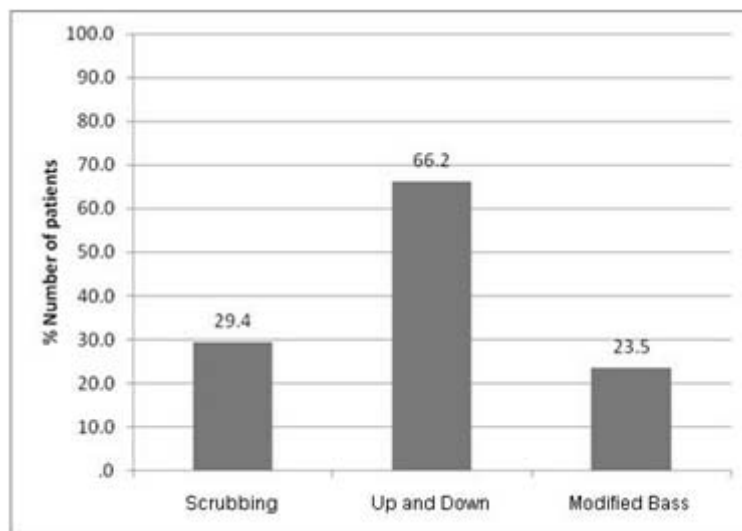


Figure 5. Tooth brushing methods of patients with dentine hypersensitivity.

Some patients with dentine hypersensitivity used more than one type of tooth brushing method.

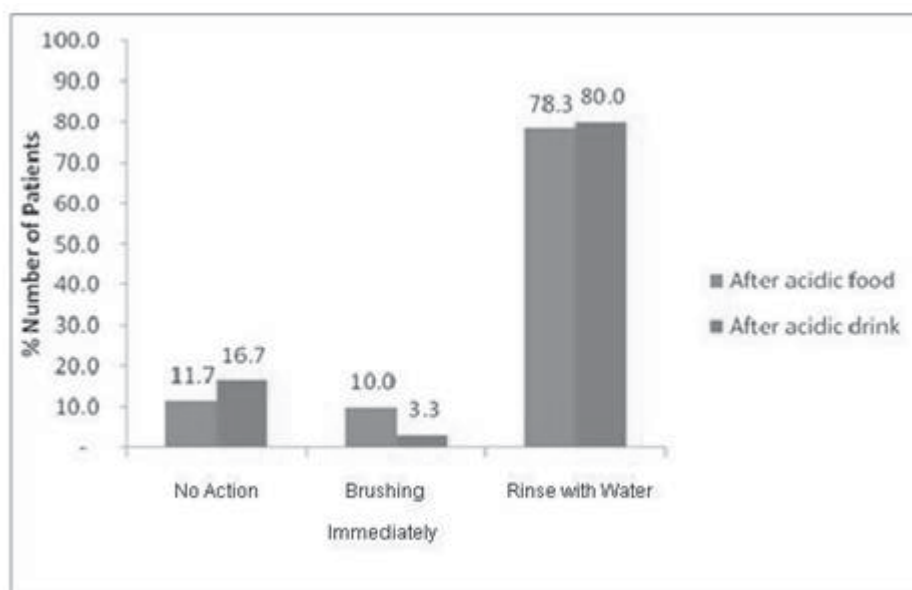


Figure 6. Behavior after acidic food or drink intake.

Discussion

The most common age stratification for the patients suffering from dentine hypersensitivity in the present study fell in the group of 41 - 50 years old, which is comparable to the Australian (41 - 49 years)⁽¹²⁾, Hong Kong (41 - 50 years)⁽¹³⁾, but younger than the Chinese and Taiwanese (50 - 59 years)^(2, 3, 10)

and is older than the UK study (30 - 39 years).⁽¹¹⁾ The increased prevalence of dentine hypersensitivity may be accounted for the fact that the longer the teeth retained in the mouth, the higher the chance they lose enamel and cementum and suffer from gingival recession. However, the prevalence of dentine hypersensitivity drops in the elderly due to the decline

in neural sensation and the changes in the dentine-pulp complex, particularly dentinal sclerosis and the deposition of secondary and tertiary dentine with increasing age.⁽¹⁴⁻¹⁶⁾

We found the teeth that were most often affected by dentine hypersensitivity were the lower premolars, followed by the upper premolars and first molars, with the incisors being the least hypersensitive ones. This distribution is also similar to previous studies.^(10,11) It has been suggested that the pattern of dentine hypersensitivity distribution can be linked to tooth brushing habits. The buccal surface of the premolars tends to receive more attention during tooth brushing as evidenced by the observation that right-handed individuals have a proclivity to brush the left surfaces more vigorously than the right surfaces. This practice gives rise to more dentine hypersensitivity as well as gingival recession than teeth on the opposite side.

It is well established that dentine hypersensitivity occurs more often in the females.^(11,12) In this study, the ratio between female: male is 14 : 1; thus, reiterating the bias toward a higher prevalence in the females. This may be accounted for by the fact that women make more regular dental visits and therefore have better oral hygiene level than men.⁽¹⁶⁾

Many hypersensitive teeth in this study also elicited some degrees of gingival recession. Most teeth had at least 1 mm of gingival recession which is similar to the study by Rees and Andy.⁽¹¹⁾ Periodontal attachment loss always occurs prior to gingival recession. This leads to expose root surface which may be susceptible to acidic food and drink. Subsequent improper tooth brushing with abrasive toothpaste may contribute to further tooth surface

loss.⁽¹⁸⁾ Similarly, an exposed cemento-enamel junction can easily lead to hypersensitivity symptom. As a consequence, periodontal attachment loss could be an earlier risk indicator for dentine hypersensitivity than gingival recession.

We found that the major stimulus that caused dentine hypersensitivity was cold drinks. The second stimulus that caused dentine hypersensitivity was sour stimuli. This result disagrees with Rees and Andy⁽¹¹⁾ and Rees *et al*^(13,19) who found heat to be the second most common pain-inducing stimulus. This difference might be accounted for the dietary pattern of different economical and cultural backgrounds. In the present study, subjects who experienced pain caused by sour stimuli were mainly the result of consuming fresh sour fruits. An *in vivo* study showed that citrus fruit juice and yoghurt can dissolve dentinal smear layer in minutes⁽⁶⁾ which could explain why hypersensitivity symptoms were frequently caused by sour stimuli. Another support for the role of acidic food in dentine hypersensitivity was that patients in severe hypersensitive group (VAS >6) avoided sour food more often than those in the mild to moderate hypersensitive group (VAS <6). This implies that acidic foods and drinks are associated with dentine hypersensitivity since acidic dietary substance erode dentine to expose dentinal tubules, particularly if followed by tooth brushing.⁽²⁰⁾ To prevent this, patients should therefore drink or rinse their mouths after consuming acidic meal. This type of behavior is better than brushing immediately according to the studies by Addy and Pearce⁽²⁰⁾ and West⁽¹⁵⁾ and Cummins.⁽²¹⁾ We found that most of the patients in this study behaved in this manner.

Conclusion

This cross-sectional study on dentine hypersensitivity patients at King Chulalongkorn Memorial Hospital shows that the prevalence of dentine hypersensitivity patients increases with aging, peaking in the 41 - 50 years age group. The premolars and molars are the most commonly affected tooth. Periodontal attachment loss could be an earlier indicator or a possible risk factor of dentine hypersensitivity patients. Preliminary data from this study suggests that dentine hypersensitivity is found in patients who have gingival recession, frequently acidic dietary consumption, and improper tooth brushing methods.

Acknowledgments

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