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RESEARCH ARTICLE

PREVALENCE AND DISTRIBUTION OF DENTINE HYPERSENSITIVITY IN A SAMPLE OF POPULATION IN SULAIMANI CITY-KURDISTAN REGION-IRAQ

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ABSTRACT

Background: Dentinal hypersensitivity (DH) is a common clinical condition of multifactorial etiology affecting one or more teeth. It can affect patients of any age group. It is a painful response usually associated with exposed dentinal tubules of a vital tooth.

Objectives: This study aimed to determine the prevalence of dentinal hypersensitivity (DH); to examine the intra-oral distribution of dentine hypersensitivity (DH) and to determine the association of dentine hypersensitivity with age, sex and address in a sample population in Sulaimani city-Kurdistan region-Iraq.

Methods: The prevalence, distribution, and possible causal factors of dentin hypersensitivity will be studied in a population attending the periodontal department, School of Dentistry, University of Sulaimani, Medical Faculty, Kurdistan region-Iraq. The stratified sample consist of 1571 (763 male and 808 female), the age (10-70 years). The patients examined for the presence of dentin hypersensitivity by means of a questionnaire and intraoral tests (air and probe stimuli). The details included teeth and sites involved with DH and the age and sex of people affected, symptoms, stimuli, pre-disposing factors. Chi-square tests were used to determine significant factors associated with DH (<0.05).

Results: There were non-significant differences in presence of: DH in males and females in relation to the residency; DH in males and females in relation to the cause; DH in males and females in relation to the stimuli; DH in males and females in relation to the site, DH in males in relation to the affected teeth upper vs. lower in the right side, DH in females in relation to the affected teeth upper vs. lower in the right side. While there were high significant differences in presence of: DH in males and females in relation to the occupation; DH in right vs. left in the lower arch and In the collective frequency of the presence of DH in both males and females in relation to the affected teeth in each quadrant.

Conclusions: There were non-significant differences in presence of DH in relation to the residency, cause, stimuli, site. DH is more in females than males. It is more in young than old patients. The major effective cause of DH is gingival recession and the most affected site with DH is the cervical region.

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INTRODUCTION

Dentinal hypersensitivity (DH) is one of the most prevalent clinical problems (Addy *et al.*, 2000). It has been defined by international workshop of DH as follows (Holland *et al.*, 1997) "Dentine hypersensitivity is characterized by 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 dental defect or pathology". Some researchers have changed the word "dentine" and added the site of DH, for example, cervical or root, resulting in different other terms (for instance, cervical sensitivity/hypersensitivity) to describe the same clinical condition (Addy, 2002). It was demonstrated that DH may last for days, weeks, or indefinitely except if remedy of dentin hypersensitivity are provide (Orchardson *et al.*, 1999). It was found that there is significant effect of dentin hypersensitivity on life quality of human being, for instance, there is limitation of dietary choices, suitable oral hygiene is disturbed, and considerable

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negative effect on esthetics (Addy, 2002; Rees *et al.*, 2003; Chu and Lo Chun-Hung *et al.*, 2010). In addition, it was reported that DH causing major discomfort to subjects in some cases it may lead to changes of emotion and attitude (Isabel *et al.*, 2009). DH affects 8% to 57% of the adult people with dentin exposure to the oral environment (Rees *et al.*, 2003). It was suggested that from 10% to 30% of mankind in world are affected with DH (Que *et al.*, 2010). Patients with periodontal diseases are at high risk, and some studies found that over 70% of patients with periodontal disease suffered from dentin hypersensitivity (Tammamo *et al.*, 2000). It was mentioned that the range 60-98% of subjects following periodontal treatment may have DH this because teeth after periodontal therapy are at higher risk of: Periodontal attachment loss, root exposure and gingival recession (Addy, 2002; Drisko, 2002; Taani and Awartani, 2002; Pashley *et al.*, 2008).

DH can occur when dentin is exposed by enamel loss lesions such as, abrasion, erosion, corrosion, attrition, or abfraction followed by the action of acids, which keep the dentinal tubules open, or because the root surface has been denuded due to loss of cementum, which is easily removed by brushing or periodontal treatment or by the association of two or more of these factors (Addy, 2005). In addition, DH may be caused by gingival recession which occurs due to: toothbrush abrasion, periodontal surgery, secondary to periodontal disease, crown preparation or excessive dental flossing, aging, patient's harmful habits and bad oral hygiene (Chabanski and Gillam, 1997; Dababneh *et al.*, 1999; Marini *et al.*, 2004). Moreover, it was mentioned that erosive agents are essential factors in initiation and progression of DH because it lead to remove the enamel or open up the dentinal tubules (Frederick and DeLaurenti, 2009). The erosive agents can be either endogenous or exogenous acids which include dietary acids such as, carbonated drinks, citrus fruits, wines, yogurt, and occupational risks (workers in battery industrialization and wine tasters) (Stoodley *et al.*, 2007). It was reported that food with pH value of less than 5.5 can cause corrosion and demineralization of the dental structure lead to erosion (Moore *et al.*, 2010). The endogenous acid result from vomiting or gastro esophageal reflux and it is a common in individuals with eating disturbance this status is recognized by generalized erosion of palatal surfaces of maxillary anterior teeth (Ling and Gillam, 1996). The number of teeth with root exposure is increase with ageing. Moreover, (Mini *et al.*, 2015) mentioned that extrusion of teeth, in the absence of an antagonist tooth, results in root exposure, which may lead to DH. Several theories try to give explanation of dentinal hypersensitivity (Transduction theory, Modulation theory and Hydrodynamic theory) however, none of these theory leads to a clear understanding of how the stimuli applied insensitive tooth aspect can cause pain, but many researchers accept the hydrodynamic theory as clarification of symptoms of DH (Chu and Lo Chun-Hung *et al.*, 2010). According to Brannstrom's hydrodynamic theory (Trowbridge, 1986), mentioned that there is a displacement of the contents of the dentinal tubules when an stimulus is applied to the external dentin surface, this result in a mechanical stimulation of the neurons at the pulp-dentinal border. The variations of temperature, humidity, osmotic and air pressure, or forces acting on the external surface of tooth lead to elevate hydrodynamic flow. Cold or

hot foods, drinks and physical pressure commonly provoke people with dentin hypersensitivity (Shah, 2015).

The present study was conducted to find out the prevalence of the dentine hypersensitivity and to determine the factors associated with this condition in a sample of population in Sulaimani City-Kurdistan Region-Iraq.

Aims of the study

- 1- To determine the prevalence of clinically assessed in addition to self-reported Dentine hypersensitivity (DH) in a sample of population of Sulaimani city Kurdistan Region, Iraq.
- 2- To locate the intra-oral distribution of Dentine hypersensitivity (DH).
- 3- To find the association of Dentine hypersensitivity with age, sex, and address.
- 4- To investigate the relationship between Dentine hypersensitivity (DH) and associated factors such as, gingival recession.

MATERIALS AND METHODS

The questionnaire included questions about the patient's name, age, gender, occupation and medical history. Special case sheet which include (name, age, cause and location of dentine hypersensitivity symptoms, stimuli, pre-disposing factors), periodontal probe and dental unit triple syringe are used in this study. The prevalence, distribution, and possible causal factors of dentin hypersensitivity will be studied in a population attending the periodontal department, School of Dentistry, Medical Faculty, University of Sulaimani, Kurdistan region, Iraq. The stratified sample consist of 1571 (763 male and 808 female), the age (10-70 years). Before examination each participant was informed about the objectives and procedures of the study and an informed consent was obtained. Ethical Approval was obtained from the Ethical committee of College of Dentistry, Medical faculty, University of Sulaimani. They answered questions about known factors associated with DH. The patients will be examined for the presence of dentin hypersensitivity by means of a questionnaire and intraoral tests (air and probe stimuli). The details included teeth and sites involved with DH and the age and sex of people affected, symptoms, stimuli, pre-disposing factors. Dentine hypersensitivity was assessed by means of tactile and air stimuli. To produce air stimuli an air blast was delivered using the dental unit triple syringe, blowing a short blast of room temperature air, being held perpendicular and 2 mm away from tooth surface, while cover the adjacent teeth with fingers or cotton rolls. The sensitivity of the tooth to the tactile stimulation was determined using a periodontal probe passed perpendicular to the tooth surface with apical movement and the pressure was gradually increased until the subject responded.

Data analysis

Associations between the different variables and dentine hypersensitivity (DH) were tested using Chi-square test. Significance between DH and other significant factors associated with DH were assumed to exist if a P value was (<0.05).

RESULTS

The data of 1571 subjects (763 males and 808 females) were analyzed. The percent of patients with DH was (44%) in males and (48%) in females. $\chi^2 = 0.322$, d.f. = 1, p-value = 0.570 (NS) as shown in Table (1)

In age group (10-19 years) the percent of males with DH (13.64%) and in females (6.25%). In addition, in age group (20-29 years) the percent of males with DH (27.27%) and in females (35.42%). Moreover, in age group (30-39 years) the percent of males with DH (15.91%) and females (12.50%). Furthermore, in age group (40-49 years) the percent of males with DH (20.45%) and females (18.75%). In age group (50-59 years) the percent of males with DH (13.64%) and females (10.42%). Finally in age group (60-69 years) the percent of males with DH (9.09%) and females (16.67%). $\chi^2 = 3.195$, d.f. = 5, p-value = 0.669 (NS) as shown in table (2).

There were high significant differences in presence of DH in males and females in relation to the occupation and student is the most affected occupation by DH. $\chi^2 = 41.901$, d.f. = 9, p-value = 0.000 (HS) as shown in Table (3).

There were non-significant differences in presence of DH in males and females from inside and outside Sulaimani city. $\chi^2 = 0.381$, d.f. = 1, p-value = 0.537 (NS) as shown in table (4).

There were non-significant differences in presence of DH in males and females in relation to the cause. The most effective cause of DH is gingival recession. $\chi^2 = 0.342$, d.f. = 5, p-value = 0.376 (NS) as shown in Table (5).

There were non-significant differences in presence of DH in males and females in relation to the stimuli and the most effective stimuli of DH is cold. $\chi^2 = 4.942$, d.f. = 6, p-value = 0.551 (NS) as shown in Table (6).

There were non-significant differences in presence of DH in males and females in relation to the site. Cervical region is the most affected area by DH. $\chi^2 = 7.577$, d.f. = 7, p-value = 0.371 (NS) as shown in Table (7).

In males there were non-significant differences in presence of DH in relation to the affected teeth: Upper vs. lower in the right side $\chi^2 = 3.411$, d.f. = 6, p-value = 0.756 (NS); Upper vs. lower in the left side $\chi^2 = 4.198$, d.f. = 6, p-value = 0.649 (NS); Right vs. left in the upper arch $\chi^2 = 9.868$, d.f. = 6, p-value = 0.130 (NS); Right vs. left in the lower arch $\chi^2 = 8.401$, d.f. = 6, p-value = 0.210 (NS) as shown in table (8).

In females there were non-significant differences in presence of DH in relation to the affected teeth: Upper vs. lower in the right side $\chi^2 = 3.325$, d.f. = 6, p-value = 0.767 (NS); Upper vs. lower in the left side $\chi^2 = 7.993$, d.f. = 6, p-value = 0.238 (NS); Right vs. left in the upper arch $\chi^2 = 6.206$, d.f. = 6, p-value = 0.401 (NS). While there was high significant difference right vs. left in the lower arch $\chi^2 = 16.902$, d.f. = 6, p-value = 0.007 (HS) as shown in Table (8).

There was high significant difference in the collective frequency of the presence of DH in both males and females in

relation to the affected teeth in each quadrant $\chi^2 = 14.988$, d.f. = 3, p-value = 0.002 (HS) as shown in Table (9).

Table 1. Frequency of the presence and absence of dentin hypersensitivity in both genders

Dentin Hypersensitivity	Genders		
	Males	Females	Total
Present	44 (44%)	48 (48%)	92 (46%)
Absent	56 (56%)	52 (52%)	108 (54%)
Total	100 (100%)	100 (100%)	200 (100%)

$\chi^2 = 0.322$, d.f. = 1, p-value = 0.570 (NS)

Table 2. Frequency of the presence of dentin hypersensitivity in both genders in relation to the age

Age	Genders		
	Males	Females	Total
10-19	6 (13.64%)	3 (6.25%)	9 (9.78%)
20-29	12 (27.27%)	17 (35.42%)	29 (31.52%)
30-39	7 (15.91%)	6 (12.50%)	13 (14.13%)
40-49	9 (20.45%)	9 (18.75%)	18 (19.57%)
50-59	6 (13.64%)	5 (10.42%)	11 (11.96%)
60-69	4 (9.09%)	8 (16.67%)	12 (13.04%)
Total	44 (100%)	48 (100%)	92 (100%)

$\chi^2 = 3.195$, d.f. = 5, p-value = 0.669 (NS)

Table 3. Frequency of the presence of dentin hypersensitivity in both genders in relation to the occupation

Occupation	Genders		
	Males	Females	Total
Doctor	2 (4.55%)	0 (0%)	2 (2.17%)
Engineer	1 (2.27%)	0 (0%)	1 (1.09%)
Guard	1 (2.27%)	0 (0%)	1 (1.09%)
Lecturer	2 (4.55%)	0 (0%)	2 (2.17%)
Officer	6 (13.64%)	8 (16.67%)	14 (15.22%)
Retired	4 (9.09%)	4 (8.33%)	8 (8.70%)
Student	12 (27.27%)	11 (22.92%)	23 (25%)
Teacher	2 (4.55%)	4 (8.33%)	6 (6.52%)
Worker	14 (31.82%)	0 (0%)	14 (15.22%)
Housewife	0 (0%)	21 (43.75%)	21 (22.83%)
Total	44 (100%)	48 (100%)	92 (100%)

$\chi^2 = 41.901$, d.f. = 9, p-value = 0.000 (HS)

Table 4. Frequency of the presence of dentin hypersensitivity in both genders in relation to the residency

Residency	Genders		
	Males	Females	Total
Inside Sulimania	23 (52.27%)	22 (45.83%)	45 (48.91%)
Outside Sulimania	21 (47.73%)	26 (54.17%)	47 (51.09%)
Total	44 (100%)	48 (100%)	92 (100%)

$\chi^2 = 0.381$, d.f. = 1, p-value = 0.537 (NS)

Table 5. Frequency of the presence of dentin hypersensitivity in both genders in relation to the cause

Cause	Genders		
	Males	Females	Total
Abrasion	1 (2.27%)	0 (0%)	1 (1.09%)
Attrition	8 (18.18%)	3 (6.25%)	11 (11.96%)
Caries	12 (27.27%)	12 (25%)	24 (26.09%)
Gingival recession	17 (38.64%)	23 (47.92%)	40 (43.48%)
Old composite filling	1 (2.27%)	3 (6.25%)	4 (4.35%)
Old amalgam filling	5 (11.36%)	7 (14.58%)	12 (13.04%)
Total	44 (100%)	48 (100%)	92 (100%)

$\chi^2 = 0.342$, d.f. = 5, p-value = 0.376 (NS)

Table 6. Frequency of the presence of dentin hypersensitivity in both genders in relation to the stimuli

Stimulus	Genders		
	Males	Females	Total
Cold	29 (65.91%)	31 (64.58%)	60 (65.22%)
Hot	0 (0%)	1 (2.08%)	1 (1.09%)
Sweet	0 (0%)	2 (4.17%)	2 (2.17%)
Cold + Hot	12 (27.27%)	13 (27.08%)	25 (27.17%)
Cold + Sweet	1 (2.27%)	1 (2.08%)	2 (2.17%)
Cold + Lemon	1 (2.27%)	0 (0%)	1 (1.09%)
Cold + Hot + Sweet	1 (2.27%)	0 (0%)	1 (1.09%)
Total	44 (100%)	48 (100%)	92 (100%)

$\chi^2 = 4.942$, d.f. = 6, p-value = 0.551 (NS)

Table 7. Frequency of the presence of dentin hypersensitivity in both genders in relation to the site

Site	Genders		
	Males	Females	Total
Buccal	3 (6.82%)	0 (0%)	3 (3.26%)
Lingual	0 (0%)	0 (0%)	0 (0%)
Incisal	6 (13.64%)	3 (6.25%)	9 (9.78%)
Cervical	16 (36.36%)	23 (47.92%)	39 (42.39%)
Mesial	4 (9.09%)	2 (4.17%)	6 (6.52%)
Distal	4 (9.09%)	3 (6.25%)	7 (7.61%)
Occlusal	6 (13.64%)	11 (22.92%)	17 (18.48%)
Disto-occlusal	2 (4.55%)	3 (6.25%)	5 (5.43%)
Mesio-occlusal	3 (6.82%)	3 (6.25%)	6 (6.52%)
Total	44 (100%)	48 (100%)	92 (100%)

$\chi^2 = 7.577$, d.f. = 7, p-value = 0.371 (NS)

Table 8. Frequency of the presence of dentin hypersensitivity in both genders in relation to the affected teeth

Males														
	Right						Left							
No.	1	3	2	2	1	1	2	11	2	2	1	1	6	1
Teeth	7	6	5	4	3	2	1	1	2	3	4	5	6	7
No.	3	9	5	1	3	3	11	7	4	3	1	3	7	4

Upper vs. lower in the right side $\chi^2 = 3.411$, d.f. = 6, p-value = 0.756 (NS)
 Upper vs. lower in the left side $\chi^2 = 4.198$, d.f. = 6, p-value = 0.649 (NS)
 Right vs. left in the upper arch $\chi^2 = 9.868$, d.f. = 6, p-value = 0.130 (NS)
 Right vs. left in the lower arch $\chi^2 = 8.401$, d.f. = 6, p-value = 0.210 (NS)

Females														
	Right						Left							
No.	4	8	3	1	3	7	10	8	4	2	2	2	4	3
Teeth	7	6	5	4	3	2	1	1	2	3	4	5	6	7
No.	3	2	1	0	1	6	8	11	10	3	0	0	4	1

Upper vs. lower in the right side $\chi^2 = 3.325$, d.f. = 6, p-value = 0.767 (NS)
 Upper vs. lower in the left side $\chi^2 = 7.993$, d.f. = 6, p-value = 0.238 (NS)
 Right vs. left in the upper arch $\chi^2 = 6.206$, d.f. = 6, p-value = 0.401 (NS)
 Right vs. left in the lower arch $\chi^2 = 16.902$, d.f. = 6, p-value = 0.007 (HS)

Table 9. Collective frequency of the presence of dentin hypersensitivity in both genders in relation to the affected teeth in each quadrant

Quadrant	Genders		Total
	Males	Females	
Upper right	12 (12%)	36 (32.43%)	48 (22.75%)
Upper left	24 (24%)	25 (22.52%)	49 (23.22%)
Lower right	35 (35%)	21 (18.92%)	56 (26.54%)
Lower left	29 (29%)	29 (26.13%)	58 (27.49%)
Total	100 (100%)	111 (100%)	211 (100%)

$\chi^2 = 14.988$, d.f. = 3, p-value = 0.002 (HS)

DISCUSSION

Dentin hypersensitivity is a popular trouble seen in clinical practice. DH is distinguished by a sharp, transitory pain in response to a sensory stimulus, which can affect the type of life through its impact on drinking, eating, brushing teeth, and breathing (Dababneh *et al.*, 1999). DH approximately can be seen in all age groups and affect one in five adults (Addy, 2002). Patients who have received periodontal treatment is four times more at risk developing dentine hypersensitivity than the general population (Drisko, 2002). The purpose of this study was to find the prevalence of DH in a sample of population in Sulaimani city, Kurdistan region –Iraq and investigate the associated factors with DH. Air blast intraoral test was used because it produced the minimum reproducibility differences when it compare to several stimulating methods (Ide *et al.*, 2001).

This study declared that dentinally persensitivity most likely occur in younger patients. In age group (20-29 years) the percent of females (35.42%) with DH and in male (27.27%), this result in consistent with (Zakereyya *et al.*, 2014) who reported that DH was greatest in the age group (21-30year) but the difference was not statistically significant. However, (Rees and Addy, 2002) demonstrated that the peak of DH in the age group (30-39 year). In addition, (Pashley,2008) showed that DH can affect a subject of any age, however, it most likely susceptible subjects are in the age group of (20-49 years) with peak dentine hypersensitivity between 30-39 years. Moreover, (Addy, 2000) suggested that dentin hypersensitivity usually occurs among patients of (30 - 40 years). Furthermore, epidemiologic study suggests that the prevalence peaks of DH was between (30 and 40 years) of age (Kehua *et al.*, 2010). This study demonstrated that DH decreased with aging this result was in agreement with (Mini *et al.*, 2015) who mentioned that DH is most likely to happen in younger patient who experience quick root surface exposure .Although, old individuals, showing root exposure, commonly they do not display painful dentine sensitivity; this can be clarified by the following factors: Decrease in cellularity; Reduction of vascularity and nerve fibers in the pulp; lack in the number of tubules; reducing pulp chamber due to an increase of reparative dentin and mineral deposition inside the tubules (dentinal sclerosis). This study found that DH affected emales (48%) more than males (44%) this result is consistent with (Addy *et al.*, 1987) Who mentioned that there was a slightly higher incidence of DH in females than in males. Also, (Ye *et al.*, 2012) reported that DH affected females more than males; this may be due to females’ manner of having intensive oral hygiene are. This study demonstrated that there was high significant difference in the collective frequency of the presence of DH in both males and females in relation to the affected teeth in each quadrant . While other study showed that statistically significantly the most affected teeth were central incisors (Zakereyya *et al.*, 2014). In addition, (Addy *et al.*, 1987; Addy, 2002; Rees *et al.*, 2003) reported that canines and premolars of upper and lower arches are the most affected teeth. This study found that the cervical region was the most affected region with DH this result was in consistent with (Rees *et al.*, 2003) who mentioned that cervical area is the commonly affected site with DH. It was reported that the difference in prevalence of dentine hypersensitivity ranging

from 1.1% to 98%. This variation has been related to: Application of different methods of investigations and assessment of DH the methods usually employed are patient questionnaires or clinical examinations; base and setting of population and behavioral factors, such as, oral hygiene habits and intake of acidic drinks and foods (Fischer *et al.*, 1992; Addy, 2002; West, 2006; Pashley *et al.*, 2008 and Amarasena, 2011).

Conclusion

In conclusion DH are more in young patients and it decrease with aging. DH is more in females than male's subjects. Gingival recession is the most effective cause of DH and the cervical area is the most affected region with DH.

REFERENCES

- Addy, M. 2005. Tooth brushing, tooth wear and dentine hypersensitivity – are they associated? *Int Dent J*, 55, 261 – 267.
- Addy M, Mostafa P, Newcombe RG. 1987. Dentine hypersensitivity: The distribution of recession, sensitivity and plaque. *J Dent.*, 15:242–8.
- Addy M. 2002. Dentine hypersensitivity: New perspectives on an old problem. *Int Dent J.*;52:367–75.
- Addy M. Tooth wear and sensitivity: Clinical advances in restorative dentistry. In: Addy M, Embery G, Edgar WM, Amarasena N, Spencer J, Ou Y, Brennan D. Dentine hypersensitivity in a private practice patient population in Australia. *J Oral Rehabil.*, 2011; 38: 52-60.
- and treatment of dentinal hypersensitivity, *Journal of OralScience*, Vol.51, No. 3, 323-332.
- Chabanski MB, Gillam DG.1997. Aetiology, prevalence and clinical features of cervical dentine sensitivity, *J Oral Rehabil*, 24, 15-19.
- Chu and Lo Chun-Hung *et al.* 2010. Dentine hypersensitivity: a review *Hong Kong Dent J.*, Vol 7 No 1.
- Dababneh RH, Khouri AT, Addy M. 1999. Dentine hypersensitivity. An enigma? A review of terminology, Drisko CH. 2002. Dentine hypersensitivity. Dental hygiene and periodontal considerations. *Int Dent J.*, 52:385-393.
- epidemiology, mechanisms, aetiology and management. *Br Dent J.*, 187:606-611.
- Fischer C, Fischer RG, Wennberg A. 1992. Prevalence and distribution of cervical dentine hypersensitivity in a population in Rio de Janeiro, Brazil. *J Dent.*, 20:272–6.
- Frederick C, DeLaurenti M, Olson M, *et al.* 2009. Comparison of Sonicare Flex Care power toothbrush and a manual toothbrush on dentin hypersensitivity, *Koninklijke Philips Electronics N.V.* Data on file.
- Holland GR, Narhi MN, Addy M, Gangarosa L, Orchardson R. 1997. Guidelines for the design and conduct of clinical trials on dentine hypersensitivity. *J Clin Periodontol.*, 24:808–13
- Ide M, Wilson RF, Ashley FP. 2001. The producibility of methods of assessment for cervical dentine hypersensitivity. *J Clin Periodontol.*, 28: 16-22.
- Isabel C.C.M.Porto^{1,2)}, Ana K. M. Andrade^{1,3)} and Marcos A.J.R.Montes.¹ 2009. Diagnosis
- Kehua Que, Yingying Fu, LIN LIN, Deyu Hu, Yun Po Zhang, Fotinos S. Panagakos, William Devizio & Luis R. Mateo, 2010. Dentine hypersensitivity reduction of a new toothpaste containing 8.0% arginine and 1450 ppm fluoride: An 8-week clinical study on Chinese adults *MA American Journal of Dentistry*, Vol. 23, Sp. Is. A.
- Ling TY, Gillam DG. 1996. The effectiveness of desensitizing agents for the treatment of cervical dentine sensitivity (CDS) a review. *J West Soc Periodontol Periodontal Abstr.*, 4, 5-12.
- Marini MG, Greggi SLA, Passanezi E, Sant'Ana ACP. 2004. Gingival recession: prevalence, extension and severity in adults, *J Appl Oral Sci.*, 12, 250-255.
- Mini.K. John¹, Dr. Sreeja S², Dr. Anulekh Babu³, Dr Vidhya⁴ Dentine Hypersensitivity-Pathogenesis and Management, 2015. *Quest Journal of Medical and Dental Science Research*, Volume 2~ Issue 1 pp: 25-32.
- Moore M, Putt M, Jain V, *et al.* 2010. In vitro assessment of dentin wear resulting from the use of the Philips Sonicare Diamond Clean power toothbrush, *Koninklijke Philips Electronics N.V.* Data on file.
- Muhammad Nasir Shah, 2015. Effect of toothpaste in reducing dentine hypersensitivity *Pakistan Oral & Dental Journal*, Vol 35, No. 2.
- Orchardson R, editors. 2000. Dentine hypersensitivity: Definition, prevalence distribution and Aetiology. *London: Martin Dunitz.*, pp. 239–48.
- Orchardson R, Gilliam D. 2006. Managing dentin hypersensitivity, *J Am Dent Assoc.*, 137, 990-8.
- Pashley DH, Tay FR, Haywood VB, Collins MC, Drisko CL. 2008. Dentine hypersensitivity: Consensus-based recommendations for the diagnosis and management of dentin hypersensitivity. *Inside Dent*, 4 (Spec Iss): 1-35.
- Que K, Ruan J, Fan X, Liang X, Hu D. 2010. A multi-centre and cross-sectional study of dentine hypersensitivity in China. *J Clin Periodontol.*, 37:631-37.
- Rees JS, Jin U, Lam S, Kudanowska I, Vowles R. 2003. The prevalence of dentine hypersensitivity in a hospital clinic population in Hong Kong. *J Dent*, 31, 453-61.
- Rees JS¹, Addy M. 2002. A cross-sectional study of dentine hypersensitivity. *J Clin Periodontol.*, Nov;29(11):997-1003.
- Stoodley P, Nguyen D, Longwell M, *et al.* 2007. Effect of the Sonicare FlexCare power toothbrush on fluoride delivery through *Streptococcus mutans* biofilms, *Compend Contin Educ Dent*, 28(1),15-22.
- Taani SD, Awartani F. 2002. Clinical evaluation of cervical dentin sensitivity (CDS) in patients attending general dental clinics (GDC) and periodontal specialty clinics (PSC). *J Clin Periodontol*, 29: 118-122.
- Tammaro S, Wennström JL, Bergenholtz G. 2000. Root-dentin sensitivity following non-surgical periodontal treatment. *J Clin Periodontol.*, 27:690-7.
- Trowbridge H O. 1986. Review of dental pain, Histology and physiology *J Endod.*, Oct;12(10):445-52.
- West NX. Dentine hypersensitivity. 2006. In: Lussi A. Dental erosion. *Monogr Oral Sci.*, 20:173-189.
- Ye W, Feng XP, Li R. 2012. The prevalence of dentine hypersensitivity in Chinese adults. *J Oral Rehabil.*, 39: 182-187.
- Zakereyya S Albashaireh* and Maram K Aljamal, 2014. Prevalence and Pattern of Dentine Hypersensitivity in a Jordanian Population in Irbid City Albashaireh and Aljamal, *Oral Hyg Health*, volume 2: issue 3.