

## Prevalence and Pattern of Dentin Hypersensitivity in a Jordanian Population in Irbid City

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### Abstract

**Background:** Dentin hypersensitivity, DH is a common oral health problem of multifactorial etiology affecting one or more teeth of many individuals on global bases. There is a growing awareness that DH has become an increasingly important condition that merits investigation from the diagnostic and problem-management perspectives. Few studies attempted to determine the size of the problem and investigate factors associated with DH amongst Jordanians.

**Objectives:** Therefore, this study aimed to determine the prevalence of clinically assessed in addition to self-reported DH and evaluate the factors associated with it in a sample of Jordanian subpopulation.

**Methods:** 1,478 subjects were recruited from teaching and public dental centers. They answered questions about known factors associated with DH. Oral examinations assessed DH in participants who reported DH in at least one of their teeth. The subjects quantified the severity of DH on 10-digits visual analogue scale. Chi-square tests were used to determine significant factors associated with DH ( $\alpha=0.05$ ).

**Results:** The prevalence of self-reported DH was 66.4%; and that of clinically diagnosed DH was 28.7%. DH was statistically significantly more in females than males; and occurred most in the age group (21-30). Mandibular central incisors were statistically significantly the most affected teeth. Heartburn, frequent vomiting, drinking acidic juices and soft drinks, bleaching, gingivitis, scaling, and orthodontic treatment were statistically significantly associated with DH.

**Conclusions:** The Prevalence of DH in Jordanian subpopulation was 28.7%. Many factors including gender, acidic juices, soft drinks, bleaching, gingivitis, recent scaling and orthodontic treatment were significantly associated with DH,  $P<0.05$ .

**Keywords:** Cervical, Diagnosed; Gingivitis; Sensitivity; Oral health; Jordan; Hypersensitivity; Prevalence

### Introduction

Dentin sensitivity (DH) is a common, painful dental condition that is frequently encountered in dental practice [1,2]. There is a growing awareness that DH has become an increasingly important condition [3]. Patients are likely to retain their teeth for long as a result of successful programs for caries prevention and periodontal disease management. Thus it is expected that research will focus more attention on the problem of dentin hypersensitivity [3].

DH is universally defined as “short, sharp pain arising from exposed dentin in response to thermal, evaporative, tactile, osmotic, or chemical stimuli which cannot be ascribed to any other form of dental defect, pathology or disease [4]. The definition describes the condition and identifies it as independent clinical identity. Moreover, it emphasizes the importance of differential diagnosis as DH may be confused with that of fractured teeth, carious teeth or marginal leakage of restorations [5].

The widely accepted hydrodynamic theory explains the mechanism of dentinal sensitivity [2,6]. The theory suggests that opening the dentinal tubules and exposing them to oral environment disturb their fluids and result in fluid movement force within the tubule's lumen [6]. The fluid movement in the dentinal tubules will eventually be propagated to the pulp and pulpal fluid movement will ensue. The later movement may stimulate the nerve endings in the pulp causing pain response.

The dental enamel or cementum loss exposes dentin because of tooth wear. Ultimately the dentinal tubules become open, and their contents

become exposed to dynamic interactions with oral environment [7]. In this context, erosion is considered the most common wear form that removes cementum, exposes dentinal tubules and initiates DH. However, abrasion, abfraction and attrition may also be involved [8].

Different factors may influence the incidence of DH. The majority of patients with DH are in the age group 30-40 [9]. Generally, the frequency of DH is more in females than in males [10-12]. The most commonly affected teeth with DH are incisors and premolars [11-13] and the least affected are molars; and the buccal aspect of the cervical area is the most affected site [11,14,15]. Personal behavior including consumption of highly acidic drinks or food; overzealous dental hygiene and previous dental procedures like periodontal therapy that may result in dentin exposure have been associated with DH [2,16].

Previous studies on the prevalence of DH have produced diverse frequencies and inconsistent findings [17]. Some studies reported figures that ranged between 8-60.3% in patients examined in general dental clinics [10,11,15,18,19]. However, a study on the prevalence of DH in patients undergoing periodontal treatment reported that

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the prevalence was 88% [19]. These wide ranges were attributed to differences in sampling methodology. The results of questionnaire-dependent studies or those of self-reported DH may exaggerate the prevalence figures. Patients may not realize the difference between DH and sensitivity arising from other oral conditions [5,8].

The experimental design may influence the prevalence as studies using intraoral tests for DH revealed low prevalence of around 15% compared to questionnaire-dependent studies [10,11]. In addition, prevalence figures may vary because of demographic and ethnic variations [20]. The number of publications related to the clinically diagnosed DH is limited [16]. There is paucity of data on the prevalence of DH and the factors relating to that condition among Jordanians.

The purpose of this study was to find out the prevalence of the DH in Jordanian population and to determine the factors associated with this condition.

## Materials and Methods

### Study population

This study was carried out in the dental teaching center (DTC) of Jordan University of Science and Technology (JUST), and in public dental centers, Irbid city, Jordan. The population of Irbid city is about 600,000. Using the power analysis with confidence interval of 2.62 at 50% accuracy level, a sample size of 1,400 citizens was considered appropriate. Patients attending the dental centers during the course of the investigation were recruited to this study. The series comprised 1,478 patients aged 16-65 years.

### Examiners' calibration

Two dentists were employed to interview the participants and examine them for the presence of DH. A questionnaire and a clinical examination data sheets were designed for data collection purposes. A visual analogue scale, VAS was formed for DH response measurements. The nature of the study was explained to the examining dentists in a meeting with the project supervisor; and the definition of DH prevalence was clearly explained to them [4]. The prevalence of DH was calculated as the number of patients with at least one tooth with DH divided by the population at risk [21]. The examining dentists were shown a demonstration on the procedure of DH intraoral tests. Patients quantified the resulting pain response on the VAS sheet. The examiners were calibrated by examining 15 volunteers during a one week period until 95% inter-and intra-examiner reliability was achieved.

### The questionnaire

The questionnaire included questions about the participant's name, age, gender, occupation and medical history. The clinical findings of interest including stomach problems, heartburn and vomiting were noted in the clinical examination data sheet. Oral hygiene habits with the type of toothbrush, the frequency of tooth brushing and the use of dental floss and interdental sticks were pointed out in the questionnaire. Tooth whitening history or the use of any whitening toothpaste or both were also mentioned. In addition, periodontal health status including bleeding on brushing and scaling history through the last 3 months prior to the interview was recorded. The questionnaire included questions about smoking habits, bruxism and orthodontic treatment in the last 3 months.

### Interviews and intraoral test procedures

The aims of the survey, the description of DH and the nature of

the clinical assessments were explained to the patients; consequently, consent was obtained from the patients to participate in the survey. Subjects were interviewed while seated on a dental chair; and DH assessments were conducted using the dental kit allocated for their treatment.

Participants were questioned about the presence of sensitivity in their teeth. Subjects who reported DH were tested clinically to confirm the presence of DH. Using the dental unit, an air jet was blown from 3-way dental syringe in a mesio-distal direction on facial, lingual or palatal surface of exposed dentin for 1 second with the tip of the syringe at 2 mm distance from the surface. The teeth were examined to rule out any other causes of sensitivity.

### DH measurement on visual analogue scale

VAS sheet was presented to the participants to quantify their response to DH. The VAS was a 10-cm horizontal line with 10 digits. VAS contained anchors designated as "0" indicated "no pain" and "10" indicated "unbearable pain". Patients with discomfort due to DH in one of their teeth were requested to quantify the perception of pain magnitude of the most sensitive tooth by drawing a mark on VAS. Marks between the digits 0-1 were considered no pain; between >1-≤ 4, mild pain; between >4- ≤ 7, moderate pain; and between >7-10 severe pain.

The patients with clinically diagnosed DH were asked to tell the stimuli type that initiated their DH response. The stimuli included cold air, water, hot food or drinks, tooth brushing or sweet. Patients were asked about previous use of desensitizing toothpaste and former professional treatment of DH.

### Data analysis

Data were analysed using statistical software (SPSS 14.0 for Windows; SPSS, Inc, Chicago, Ill). Associations between the various variables and HD were tested using Chi-square test. Associations between HD and other variables were assumed to exist if a P value was <0.05.

### Results

The data on 1,478 subjects, 929 females and 549 males were analyzed. The prevalence of self-reported DH, the number of subjects reporting DH in at least one tooth, that is expressed as a percentage of the whole population was 66.4%, n=981. Of the 981 patients who thought they had 'sensitive' teeth, only 425 responded positively to the intraoral tests for DH. Thus, the prevalence of clinically diagnosed DH was 28.8%.

The number of females with clinically diagnosed DH was 301 and that of males was 124. Apparently, 70.8% of patients with clinically diagnosed DH were females. The percentage of females with clinically diagnosed DH was 32.4%; and that of males was 22.6% of the entire study population. Chi-square test demonstrated that the association between gender and DH was significant, P<.0001.

The age distribution within subjects is shown in Figure 1. Clinical assessments demonstrated that the number of subjects with clinically diagnosed DH in the age group 21-30 represented about 33.6% of subjects with clinically diagnosed DH; and was higher than the rest of age groups but the differences were not statistically significant.

The number of subjects with and with no DH according to factors that were significantly associated with DH is detailed in Table 1. The factors that were significantly associated with DH were gender,

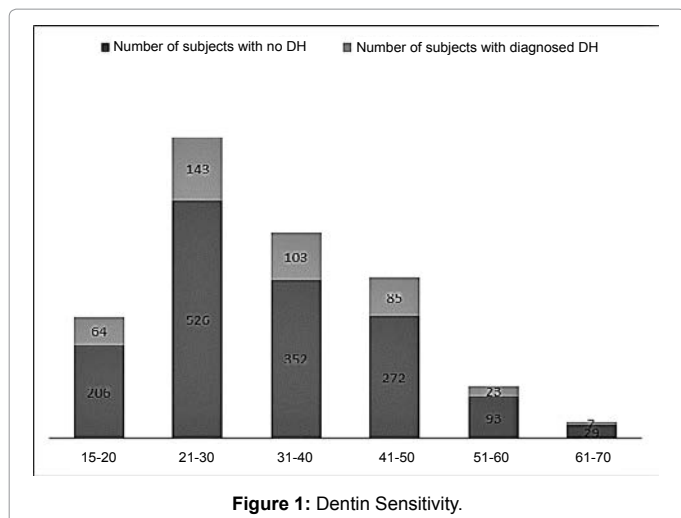


Figure 1: Dentin Sensitivity.

Factors	DH	No DH	total	P value*
Heartburn	115	221	336	0.012
Vomiting	23	26	49	0.004
Gender	124	425	549	0.0001
Males	301	628	929	
Female				
Soft-drink intake	334	749	1083	0.014
yes	91	304	395	
No				
Acidic juice intake	391	923	1314	0.022
Yes	34	130	164	
No				
Whitening tooth paste	71	135	206	0.051
Bleaching	19	16	35	0.001
Gingivitis	237	484	721	0.001
Scaling	98	181	279	0.009
Orthodontic treatment	112	53	165	0.0001

\*Chi-square test

Table 1: Number of subjects with and with no dentin hypersensitivity (DH) according to the factors assessed in the study.

heartburn, vomiting, soft-drink intake, acidic juices intake, tooth brushing with bleaching toothpaste, bleaching, gingivitis, scaling of teeth and orthodontic treatment in last 3 months. Additionally, the results analysis using chi-square test demonstrated that mandibular anterior teeth were significantly affected with DH compared to teeth in other locations,  $P < 0.0001$ ). However, education, occupation, smoking, bruxism habits, systemic conditions including heart diseases, hypertension and diabetes were not significantly associated with DH,  $P > 0.05$ . Moreover, oral hygiene measures comprising tooth brushing frequency, the texture of toothbrush and the use of auxiliary aids were not significantly associated with DH,  $P > 0.05$ .

The results revealed that cold air evoked DH in 73% of subjects with DH; cold drinks in 62%; hot drinks in 12%; tooth brushing in 10%. These DH evoking factors were significantly associated with DH,  $P < 0.05$ . Only 12% of the patients with DH sought professional help and 9% of the patients used desensitizing toothpaste.

The tooth type that were affected most with DH were in a descending order, the mandibular left central incisor; the mandibular right and left lateral incisors; and maxillary right central incisor. Most patients quantified their pain as a result of DH between the 4th and 6th digits on the VAS; and this was considered moderate pain.

## Discussion

The aim of this study was to find the prevalence of DH in Irbid city, Jordan and investigate its associated factors associated with it.

VAS was used in this study, because it is a simple and economic technique that has been used for the evaluation of subjective experience [22]. Air blast intraoral test was chosen because it produced the least reproducibility differences compared to those of several stimulating methods [23].

The prevalence of DH was calculated as the number of patients with at least one tooth with DH divided by the population at risk [21]. The current results are within range reported in previous reports [9,24] and consistent with those of previous reports for self-reported [9,19] and clinically diagnosed DH [11,15]. In this study, the prevalence of self-reported DH was (66.4%) more than that of clinically diagnosed DH (28.8%) after clinical examinations. The higher prevalence might be attributed to patients being unable to differentiate between DH and sensitivity due to other causes including dental caries and cracked tooth syndrome [10,14]. In contrast, studies depending on clinical examinations use well-defined clinical criteria for DH diagnosis [11,15,25]. Whilst self-reported DH results are useful and should not be underestimated, the results of this study indicated that clinical tests might be a more reliable method for determining the prevalence of DH; and that is supported by a previous report [10]. The prevalence of DH in this study was less than the range 60-98% reported for previous studies on subjects undergoing periodontal therapy [18]. Apparently, teeth undergoing periodontal treatment are at greater risk of periodontal attachment loss, root exposure and gingival recession, which lead to dentin exposure and eventually result in DH.

In the current study, DH affected females more than males; a result that is consistent with previous reports and may be attributed to females' attitude of having laborious oral hygiene care [11,13,25]. The association between DH and subjects' age groups varied considerably. DH was greatest in the age group 21-30 but the difference was not statistically significant. Other studies reported a DH peak in the age group 30-39; [25] and in age group 40-50 in patients undergoing periodontal treatment [14]. The current study confirmed the findings of previous reports [26] that teeth's bleaching is significantly associated with DH,  $p < 0.001$ .

Apparently, acids are determinant factors in DH incidence. Intrinsic acids get to the oral cavity of patients with heartburn and frequent vomiting conditions. Soft drinks and acidic juices of low pH are consumed frequently in Jordan especially in summer. Acids tend to wear away vulnerable cemental tissue from the root surface and expose dentinal tubules, which are sensitive to DH evoking factors and result in mild to severe forms of DH. The results of the current study demonstrated that cold air and cold drinks produced the maximum provoking effects of DH. This finding is consistent with several previous reports [9,14,25]. However, tooth brushing was the most severe provoking factor in another report [15].

Mandibular anterior and incisors in particular are the most vulnerable teeth to DH. Premolars were the second most affected teeth. Both results were consistent with the results of another report [11,15].

Most of subjects in the current study rated DH between mild to moderate and thus only 12% of them sought a professional treatment for DH; and 9% used desensitizing toothpaste. These results were consistent with the results of another report [27]. Patients who brushed their teeth frequently had significantly less DH. Fluoride toothpaste

at present appears to provide little preventive benefits to DH, which should not translate to ineffective [2].

Results demonstrated that gingivitis was associated significantly with DH, which is supported by another report [18]. Similarly, teeth scaling was significantly associated with DH; a finding supported by another report [11]. Gingivitis and scaling tend to expose root dentin and DH usually follows. The current study is one of a few that examined the association between DH and previous orthodontic treatment; a significant association was evident in this study. This result might be attributed to tooth movement and possible cervical dentin exposure as well as low oral hygiene status.

## Conclusion

The prevalence of self-reported DH was 66.4% and that of clinically diagnosed DH was 28.7%. The number of females with DH was significantly more than that of males. DH featured most in the age group 21-30. The factors that were significantly associated with DH included, frequent vomiting, heartburn, soft- drink and acidic juices intake, bleaching, gingivitis, scaling and orthodontic treatment. A verbal consent was obtained from subjects before commencement of DH assessments.

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