

Prevalence of dentine hypersensitivity among university students in Turkey

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Abstract

Background and Objective: Dentine hypersensitivity (DH) is a common clinical finding with a wide variation in prevalence values. There is lack of data on the prevalence of dentinal sensitivity in Turkish population. The aim of this study was to establish the prevalence of DH and to examine some associated factors such as initiating stimuli among university students in Kırıkkale, Turkey.

Materials and Methods: A cross-sectional survey was conducted among undergraduates of University of Kırıkkale, Turkey. An electronic questionnaire was developed and distributed via e-mail to undergraduate students in Kırıkkale University. Self-administered questionnaire elicited information on demography, self-reported dentinal sensitivity, the trigger factor, professional treatment taken, and duration time. Test of significance was done with Chi square statistics. $P < 0.05$ was considered as significant.

Results: A total of 1463 responses were evaluated in this study. One hundred and twenty-four students were diagnosed as having DH, giving a prevalence figure of 8.4%. The prevalence of DH in females was significantly higher than that in males. The most common initiating factor was cold drinks. Tooth sensitivity was found to be common among hard toothbrush users. About 46% of patients reported that they had not undergone any treatment for the discomfort and 35% reported having had some sort of treatment. Among the participants with dentinal sensitivity, 58.8% of the respondents reported that they use soft drinks occasionally. Approximately 64.2% of the patients claimed that DH was present for 1–6 days and the majority (87%) of the patients with hypersensitive teeth experienced pain occasionally.

Conclusion: The prevalence of DH among university students was 8.4%. DH is not a common problem in undergraduate university students.

Key words: Dentine hypersensitivity, prevalence, Turkish population

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Introduction

Dentine hypersensitivity (DH) may be defined as a transient pain arising from exposed dentine, typically in response to chemical, thermal, tactile, or osmotic stimuli, which cannot be explained by any other dental defect or pathology.^[1] The prevalence of DH has been reported over the years in a variety of ways: as greater than 40 million people in the U.S. annually,^[2] 14.3% of all dental patients,^[3] between 8% and 57% of adult dentate population,^[4] and up to 30% of adults at some time during their lifetime.^[5] Differences in national or regional

economic development, daily diet, oral hygiene levels, and attitudes towards oral disease all will affect the detection rate of DH.^[6] DH affects eating, drinking, and breathing. Increased hypersensitivity hinders the ability to control dental plaque effectively and can therefore compromise oral health. Severe hypersensitivity may even result in emotional changes that alter lifestyle.^[7] Several theories have been proposed to explain the mechanism of dentine sensitivity and, therefore, of DH.^[3]

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Of these the most widely accepted theories is the so-called hydrodynamic theory of sensitivity. This theory postulates that rapid shifts, in either direction, of the fluids within the dentinal tubules, following stimulus application, result in activation of sensory nerves in the pulp/inner dentine region of the tooth.^[8,9] It has been reported that there is a slightly higher incidence of DH in females compared with males.^[10-13] This difference is, however, not statistically significant.^[14]

Cold and air stimulation are known to be the most common stimuli^[15,16] while dietary acid has also been shown to have a significant potential in evoking DH.^[17] The relationship between DH and ageing is unclear. It has been suggested that with the lifespan of the general population increasing, and more people keeping their teeth longer, hypersensitivity will increase in prevalence. This seems to make sense on the basis that gingival recession and loss of enamel and cementum is more prevalent in older individuals.^[14] DH has been described as generally occurring in patients 30 to 40 years old;^[18] however, with the changes of lifestyles and dietary patterns, DH is becoming more prevalent in younger age groups. It was, therefore, the aim of this study to assess and afterwards provide information on the experience of residential students of Kırıkkale University, Kırıkkale, Turkey, about “sensitive teeth.”

Materials and Methods

A cross-sectional survey was conducted among undergraduates of University of Kırıkkale, Turkey. The main campus of Kırıkkale University is situated on Ankara-Kırıkkale Main Road, 7 km away from the city center, in an area of 5500 acres. An electronic questionnaire was developed and distributed via e-mail to undergraduate students in Kırıkkale University. The questions asked were based on the questionnaire used by Flynn *et al.*^[11] (with small modifications) to determine the prevalence of “hypersensitive” teeth in the West of Scotland. The tool of data collection was a web-based questionnaire that elicited information on demography, self-reported dentinal sensitivity, the trigger factor, action taken, duration of DH, and dietary pattern.

The questionnaires were retrieved immediately after completion for analysis of their responses. Statistical analysis was performed using SPSS Statistical Software version 15.0 (SPSS Inc., Chicago, Illinois, USA) for Windows. Frequencies and proportions were calculated. Test of significance was done with Chi square statistics. $P < 0.05$ was considered as significant.

Results

A total of 5684 surveys were sent electronically; of these, 23 (8.6%) were determined to be undeliverable. The majority of these undeliverable surveys resulted because

the recipient's e-mail server would not accept unsolicited electronic mail despite repeated attempts to resend the messages. Of the 3465 surveys that reached their recipients, 1463 (57%) of the surveys were completed and returned by the undergraduate university students.

Of the 1463 (676 females, 787 males) participants (age range between 17 and 33, with a majority of the respondents aged 21 years) participating in the survey, 124 (8.4%) complained of symptoms of hypersensitive teeth. Of those complaining of hypersensitive teeth, males accounted for 45% (56/124) while females accounted for 55% (68/124) ($P = 0.044$).

The results showed that drinking (56%) was the most mentioned oral habit affected by sensitivity, followed by eating (26.4%) and tooth brushing (17.6%).

Thirty-six (29%) of the respondents that used soft drinks reported they often had tooth sensitivity, 73 (58.8%) occasionally, and 15 (12.1%) rarely, while 13 (10.5%) of respondents who used citrus fruit often had tooth sensitivity, 94 (75.8%) occasionally, and 17 (13.7%) rarely.

When asked if they could brush their teeth without discomfort 31% of subjects claimed that they were able to brush their teeth without discomfort, 46% suffered mild discomfort, 17% suffered moderate discomfort, and only 6% suffered severe discomfort.

In relation to frequency of hypersensitivity in reaction to stimulus, the majority (87%) of the patients with hypersensitive teeth experienced pain “occasionally”. Only 2% claimed to have pain “all the time”, while 11% encountered pain “most of time”.

Approximately 64.2% the patients claimed that DH was present for 1 to 6 days, while 24.6% reported duration 1 to 4 weeks. Moreover, 9.9% stated that their discomfort lasted 1 to 12 months, while 1.3% indicated that it lasted more than 1 year.

Medium-bristled toothbrushes use was reported by 38 (30.6%) respondents with DH, while 64 (51.6%) used hard toothbrushes and 17.8% of the respondents with DH used soft toothbrushes.

About 46% of patients reported that they had not undergone any treatment for the discomfort while 35% reported having had some sort of treatment and 9% did not answer the question.

Discussion

DH has been studied for several years, and it is reported as a painful condition that originates from the exposure

of dentinal tubules when the thickness of the enamel or cement is significantly reduced. Usually, the exposed area is subjected to several kinds of stimuli, resulting in sharp acute pain. This painful condition makes eating and oral hygiene very difficult.^[19]

The prevalence of DH varies from 45% to 57%.^[4] These variations are likely due to differences in the populations studied and the methods of investigation (for example, questionnaires or clinical examinations). The prevalence of DH is between 60% and 98% in patients with periodontitis.^[16]

The overall prevalence figure for DH reported in this study was 8.4%, lower than many of the prevalence figures reported previously [Table 1]. Some studies which were performed in general dental practice reported lower prevalence figures, varying from 2.8% to 15%,^[21,25,28,33] possibly due to the fact that most subjects investigated in these studies were below 50 years of age. However, some studies with clinical examination in university clinics reported higher prevalence values of 43%,^[12,23,24,26,34] which was probably a result of the smaller sample sizes and sample populations from the periodontology departments at the universities. Moreover, two previously published studies carried out in a university student population report prevalence values of 68.4%^[29] and 52.8%,^[35] which were higher than our findings.

The diversity of reports may be in part caused by different methods used to diagnose the condition, and it is generally

considered that surveys which rely on patient questionnaires alone greatly exaggerate the prevalence figures and thereby yield misleading data. Patients' own evaluations were not a reliable index, because some patients tended to blame other forms of dental pain or hypersensitive teeth.^[11]

It is believed that DH occurs more commonly in females.^[8,10,11,36] In the present study, the male-to-female ratio of DH was 1:1.5 ($P=0.044$) which is consistent with the ratio of 1:16 reported by Orchardson and Collins.^[12] Rees and Addy^[33] reported an even higher ratio of 1:2.5. Other studies^[13,24,25,31] have also found that women are more susceptible to DH than men. The reasons for this difference are not yet clear, but have been presumed to be possibly related to the fact that women have better overall healthcare and oral hygiene awareness, which would make them more sensitive to DH.^[5]

Several studies have attempted to determine stimuli provoking DH. Response to cold is often cited as the most prevalent stimulus, as reported in the present study where 69% identified cold as painful status. Compared to previous studies, our prevalence figure is in close agreement with the 71% reported by Chabanski *et al.*^[16] and the 74% reported by Orchardson and Collins.^[12] Other studies have also reported cold as the most common stimulus in provoking DH.^[10,11,29,34,37]

Eating and brushing were indicated as less interfered with than drinking. This is similar to the findings of Taani and

Table 1: Summary of prevalence studies on dentine hypersensitivity

Authors	Country	Setting	Study type	n	Prevalence (%)
Jensen, 1964 ^[20]	USA	University	Clinical	3000	30
Graf and Glase, 1977 ^[21]	Switzerland	Practice	Clinical	351	15
Flynn <i>et al.</i> , 1985 ^[11]	UK	University	Clinical	369	18
Orchardson and Collins, 1987 ^[12]	UK	University	Clinical	109	74
Fischer <i>et al.</i> , 1992 ^[10]	Brazil	University	Clinical	635	17
Murray and Roberts, 1994 ^[22]	Indonesia	Not stated	Questionnaire	1000	27
Murray and Roberts, 1994 ^[22]	USA	Not stated	Questionnaire	1000	18
Murray and Roberts, 1994 ^[22]	Japan	Not stated	Questionnaire	1000	16
Murray and Roberts, 1994 ^[22]	France	Not stated	Questionnaire	1000	14
Murray and Roberts, 1994 ^[22]	Germany	Not stated	Questionnaire	1000	13
Murray and Roberts, 1994 ^[22]	Australia	Not stated	Questionnaire	1000	13
Chabanski <i>et al.</i> , 1997 ^[23]	UK	University	Clinical	51	73
Irwin and McCusker, 1997	UK	Practice	Questionnaire	250	57
Liu <i>et al.</i> , 1998 ^[24]	Taiwan	University	Clinical	780	32
Rees, 2000 ^[25]	UK	Practice	Clinical	3593	4
Taani and Awartani, 2002 ^[26]	Saudi Arabia	University	Clinical	295	42–60
Clayton <i>et al.</i> , 2002 ^[27]	UK	Air force	Questionnaire	228	50
Rees and Addy, 2004 ^[28]	UK	Practice	Clinical	5477	2.8
Bamise <i>et al.</i> , 2007 ^[17]	Nigeria	University	Clinical	2165	1.34
Bamise <i>et al.</i> , 2010 ^[29]	Nigeria	Not stated	Questionnaire	1019	68.4
Que <i>et al.</i> , 2010 ^[30]	Chinese	Not stated	Clinical	2640	41.7
Ye <i>et al.</i> , 2011 ^[31]	Chinese	Not stated	Clinical	2120	34.1
Amarasena <i>et al.</i> , 2011 ^[32]	Australia	Practice	Questionnaire	12692	7.6
Amayo <i>et al.</i> , 2011 ^[31]	Nigeria	Not stated	Questionnaire	400	52.8

Awartani^[26] and Bamise et al.^[29] that 64% of the DH in their patients did not interfere with normal functions of eating and brushing. This has been explained by the fact that drinking water gains access to relatively more sites in the mouth.^[17]

Only 6% of the DH sufferers in the present study avoided brushing the sensitive area, which corresponds well to 1% to 12% (mean 7.3%) reported Murray and Roberts.^[22] As many as 82% of the patients claimed that they brushed their teeth at least twice a day. However, these encouragingly high figures may reflect what the patients believe they should do rather than they actually did.

Both endogenous (intrinsic) acid and exogenous (extrinsic) sources of acids are responsible for the increasing incidence and high prevalence of tooth erosion and associated tooth sensitivity observed in many countries, in both children and adults.^[38] Consumption and sales report of acidic foods and beverages, epidemiologic surveys, studies *in vitro* and *in situ*, and review publications all provide strong evidence that acid erosion is a dominant factor in the tooth wear prevalence figures.^[39] The data from such studies indicated that, depending on susceptibility and without the synergistic effects of other tooth wear factors such as abrasion, individuals consuming 1 L of soft drinks per day could lose 1 mm of enamel in 2 to 20 years.^[40] Studies *in vitro* have also shown that a variety of acids will readily etch dentine and expose dentinal tubules.^[13] Of more relevance to the clinical situation, a range of dietary products, particularly fruits and fruit drinks, will dissolve the dentine smear layer in a matter of a few minutes.^[13,41] Saliva appears to offer little protection^[13] and this would be consistent with the slow buffering of acids in the mouth.^[13] In this study, 36 (29%) and 13 (12%) participants who reported dentinal sensitivity ingested soft drink and citrus fruit often. Although the habitual ingestion of soft drinks, which are mostly carbonated, causes tooth wear by erosion of enamel and dentine leading subsequently to dentinal sensitivity, ingestion of soft drinks with straw is a precautionary measure that limits its contact with surfaces of teeth by directing the drink towards the oropharynx. This implies that erosion may have limited contribution to prevalence of dentinal sensitivity among the studied participants.

The explanation for not seeking dental care is due to the fact that dentinal sensitivity is not spontaneous but rather stimulated, so affected individuals develop adaptive behavior of restricting self from precipitants and avoiding affected using side of the mouth as about three-quarters of the participants had dentinal sensitivity on only one side of the mouth.^[35,42] Scientists have postulated that many patients assume that their condition is a natural occurrence developing with age or that it is untreatable.^[42] The dependence in Turkey on self-care for oral health problems and seeking dental care only when situations are unbearable may also be contributory.

Dentine is normally covered by enamel in the crown region and by periodontal tissues in the root area. Under these circumstances, dentine is protected from wear. However, dentine may be exposed by loss of enamel or periodontal tissues^[13] the latter usually referred to as gingival recession. Removal of enamel may occur as a result of non-carious cervical lesions (erosion, abrasion, abfraction) and attrition while exposure of root may be due to chronic trauma from faulty tooth brushing and habits.^[39] In the present study, 51.6% respondents with DH used hard toothbrushes. As tooth brushing appears to be an etiological factor in DH, instruction in proper brushing technique that use of excessive force and hard toothbrushes should be avoided to prevent further loss of dentine and the resulting hypersensitivity.^[8] Drisko^[43] also suggested that patients with tooth sensitivity should avoid hard bristled brushes without end rounded bristles.

At the end of the discussing the findings in detail, it would be worthwhile describing some limitations and strengths of this study. One of the main limitations would be results from questionnaire studies relying on the patient's perception of the condition tend to overestimate the problem.^[15] This may be in part because of the patient's difficulty in determining the type of dental pain they may be experiencing at the time. Another problem with this study was the questionnaire methods. Previously published questionnaire studies mainly performed with the face-to-face interview; however, in the present study, web-based survey was used. A further difficulty with web surveys is that they may be harder to validate than questionnaires conducted face to face or with local participants. A chronic problem in surveys is poor response rates, perhaps due to survey fatigue or even reaction against "survey serfdom."^[44] This may also affect web surveys.^[45] Beside these disadvantages, electronic surveys have several advantages include the development of question scales and multiple choice answers from qualitative exploratory interview data, elimination of question bias through proper wording, and the use of clear, unambiguous, and concise wording. Like postal surveys, successful e-mail surveys have been shown to include: informed consent information, rating definitions and examples, rating scale formats such as Likert type, semantic differential scales, and nominal scales, and a set of demographic items.^[46] In addition, open-ended questions can be successfully accommodated in e-mail surveys. Respondents were found to write lengthier and more self-disclosing comments than they do on mail surveys.^[47,48] In addition to this Internet-based survey research may save time for researchers. As already noted, online surveys allow a researcher to reach thousands of people with common characteristics in a short amount of time, despite possibly being separated by great geographic distances.^[48,49] A researcher interested in surveying hard-to-reach populations can quickly gain access to large numbers of such individuals by posting invitations to participate to newsgroups, chat rooms, and message board

communities. In the face-to-face research environment, it would take considerably longer -- if it were possible at all -- to find an equivalent number of people with specific attributes, interests, and attitudes in one location.

Conclusion

In conclusion, this cross-sectional study found that the prevalence of DH among university students in Turkey was 8.4%. The prevalence of dentine sensitivity in this sample was lower compared to most of studies carried out previously in different populations.

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