



Prevalence and Risk Indicators of Dentine Hypersensitivity among Adults Living in Riyadh City, Saudi Arabia

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ABSTRACT

Objectives: To explore the prevalence of dentine hypersensitivity and associated risk indicators among Saudi adults in Riyadh. **Methods:** A cross-sectional study was designed to assess the presence of dentine hypersensitivity in 547 adults who attended the College of Dentistry's clinics. The assessment tools were questionnaires and clinical dental examinations. Questionnaires included sections of sociodemographic, behavioral, dietary and medical condition variables. Dentine hypersensitivity was examined by passing dental explorers on all teeth surfaces in addition to the application of a blast of cold air from three-in-one syringe. Statistical analyses included descriptive statistics, t-tests, One-Way Analysis of variance and correlation coefficient tests. **Results:** Dentine hypersensitivity was observed in 759 teeth among 182 participants yielding tooth prevalence and person's prevalence of 4.8% and 33.27% respectively. The mean number of teeth with dentine hypersensitivity was 1.39 teeth per person. Dentine hypersensitivity was not significantly related to gender, marital status, or occupation. Also, dentine hypersensitivity was not related to smoking, brushing, flossing, and sewak uses. Drinking soda and coffee, and eating citrus fruits, pickles and seeds were not significantly correlated to dentine hypersensitivity. No associations of dentine hypersensitivity with diabetes, anorexia or Bulimia Nervosa were found. The mean number of teeth with dentine hypersensitivity was higher among those who use of desensitizing toothpaste and those with GERD. **Conclusion:** Dentine hypersensitivity was present in 4.8 teeth and in 33.3 persons. No significant associations between demographic, behavioral, and medical conditions variable were observed with dentine hypersensitivity except for desensitizing agents users and those suffering GERD condition.

Keywords: Prevalence, Risk, Indicator, Dentine, Hypersensitivity

INTRODUCTION

Dentine hypersensitivity is defined as a short, sharp pain arising from exposed dentin in response to stimuli typically thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other form of dental defect or disease" according to the Canadian Advisory Board on Dentin hypersensitivity [1].

Dentine hypersensitivity might occur due to the reaction of the pulp-dentine complex to mechanical and immunological stimuli to exposed dentine. Some of these changes involve neurogenic inflammation of the pulp underexposed open tubules [2]. Dentin hypersensitivity can affect people with all age groups and regardless of their gender [3]. The condition is quite prevalent with a range of 4 and 69% of adults population reported the condition [4]. The prevalence of dentine hypersensitivity was varied from one nation to another. The reported prevalence of adult subjects with dentine hypersensitivity was 1.3% in Nigeria [5], 3.8% in the UK [6], and 12.3% in the United States [7], 27.1% in China [7], and 55% in India [8].

Several etiologic and risk factors for dentine hypersensitivity have been examined. Exposure of dentine might occur because of loss of enamel layer due to attrition, abrasion, and erosion [9,10]. Exposure of dentine can result also from the gingival recession and eventually loss of cementum [11]. Age, smoking, type of toothbrush were reported as risk factors for dentine hypersensitivity in one study [8]. Acidic drinks and foods, gastric reflux, aggressive or frequent tooth brushing, and periodontal treatment were all implicated as causes of dentine hypersensitivity in previous literature [12-14]. Studies of dentine hypersensitivity in Saudi Arabia were lacking. Reviewing the dental literature, no study was found to address dentine hypersensitivity among Saudi adults population. The aim of this study was to explore the prevalence of dentine hypersensitivity and the pattern of risk indicators among adults in Riyadh, Saudi Arabia.

MATERIALS AND METHODS

This study is a cross-sectional observational, analytical study of the prevalence of dentine hypersensitivity and its associated factors among Saudi adults. Ethical approval for this project was obtained from the IRB committee of King Abdullah Medical Research Center, Saudi Arabia prior to the study (SP18/451/R). Participants were asked to sign consent forms before the interviews and clinical examination.

The study participants were Saudi patients aged 18 years and above who attended the Dental Clinics of the College of Dentistry, King Saud bin Abdulaziz for Health Sciences University between September and October 2018. The sample size calculation revealed a number of 384 are needed based on a confidence interval of 95%. The sample size completes the study was 550 participants based on a convenient sampling technique. All participants of the dental clinic were invited to participate in the study.

The assessment tools of this study were questionnaires and clinical dental examinations. Questionnaires were prepared to have the following sections: A) Sociodemographic data including age, gender, marital status, education, and occupation. B) Behavioral variables counting smoking status and oral hygiene practices which included tooth brushing, use of dental floss, use of sewak, and use of desensitizing toothpaste. D) The diet includes frequency and type of food eaten, drinking soda and coffee. E) The medical condition of participants such as Gastroesophageal reflux disease (GERD), diabetes, anorexia, and bulimia nervosa. Participants were interviewed by one of the research team followed by clinical dental examinations. Clinical dental examinations were conducted by three senior dental students who were trained on the assessment criteria under the supervision of faculty members. The examination took place in the dental clinics of King Saud bin Abdul-Aziz for Health and Sciences. Dental chair, dental light illuminations, dental mirror, cow horn explorer and periodontal probe were used in the examinations. Dentine hypersensitivity was diagnosed based on clinical dental examination by passing dental explorer on all teeth surfaces in addition to the application of a blast of cold air from three-in-one syringe connected to the dental unit. The diagnosis was augmented by experience symptoms expressed by participants through questionnaires. Each participant was categorized into either have "no dentine hypersensitivity or yes dentine hypersensitivity". Upon clinical examinations, teeth with sensitivity due to active dental caries, defective restorations, abrasion, erosion, abfraction, attrition, wedge-shaped defect, were excluded from the diagnosis. The root surfaces that were exposed in examined teeth were also excluded from the diagnosis. Pain or sensitivity from these conditions might mimic that from dentine hypersensitivity alone. The totally edentulous subjects and those with fixed orthodontic treatment and fixed prostheses were excluded from the study.

Collected data were entered and analyzed using the SPSS statistical program version 23. Statistical analyses included the following: A) Descriptive statistics including number and percentages of participants in each category in addition to the means number of teeth with dentine hypersensitivity and other independent variables; B) T-test and One-Way Analysis of Variance to assess the differences in means of teeth with dentine hypersensitivity among demographics, behaviors, and medical conditions; C) Correlation coefficient to assess the relationship between the mean number of teeth with dentine hypersensitivity with other continuous variables.

RESULTS

The total number of participants was 547 subjects. The number of teeth examined for dentine hypersensitivity was 15811 teeth, ranging from 7 to 32 teeth per individual. Dentine hypersensitivity was observed in 759 teeth (4.8%) among 182 participants (33.27%). Therefore the tooth prevalence of dentine hypersensitivity was 4.8% while the person prevalence of dentine hypersensitivity was 33.27%. The mean number of teeth with dentine hypersensitivity per person was 1.39 teeth, ranging from one to 13 teeth.

The demographic characteristics of the study sample were presented in Table 1. About 61% of the sample was males and more than half of them were singles. Approximately 89% of participants had a high school education and above and only 11% has intermediate education. Most of the participants were university students or professionals and about 18% were unemployed. Table 1 also presented the mean number of teeth with dentine hypersensitivity among different demographic characteristics. The mean number of teeth with dentine hypersensitivity was not significantly different among genders, marital status, or occupation categories.

Table 1 Presented the mean number of teeth with dentine hypersensitivity among different demographic characteristics.

Variable	Category	Number	Percentage (%)	Mean	SD	F or T	p-value
Gender	Male	336	61.4%	1.44	2.66	0.599	0.549**
	Female	211	38.6%	1.3	2.515		
Marital Status	Single	292	53.5%	1.18	2.463	1.55	0.201*
	Married	225	41.2%	1.59	2.723		
	Divorced	20	3.7%	1.95	2.892		
	Widowed	9	1.6%	2	3.279		
Education	Intermediate	61	11.2%	1.92	2.951	1.61	0.202*
	High school -Diploma	240	43.9%	1.25	2.521		
	Bachelor and above	246	45.0%	1.39	2.586		
Occupation	Student	130	27.2%	1.3	2.288	0.87	0.456*
	Professional	208	43.5%	1.42	2.928		
	Worker	53	11.1%	1.72	2.854		
	Unemployed	87	18.2%	1.19	2.254		

*Using one-way analysis of variance; ** Using independent samples t-tests

The distribution of the mean number of teeth with dentine hypersensitivity among smoking and oral hygiene practice variables was presented in Table 2. Current smokers comprised 21% of participants. Dentine hypersensitivity was slightly less in non-smokers compared with former and current smokers; however, the difference was not statistically significant. Type of smoking was not related to the presence of dentine hypersensitivity; however, those with a combination of cigarette smoking and shisha smoking were having higher teeth with dentine hypersensitivity (3.13 teeth). About 64% of participants brushed their teeth regularly, with 11% used a hard toothbrush and most of them did not brush their teeth after meals. The mean number of teeth with dentine hypersensitivity was not related to brushing teeth or the type of toothbrush used. In addition, those who brushed after each meal were not having teeth with more dentine hypersensitivity. The participants with dentine hypersensitivity were used desensitizing toothpaste significantly higher than those with no dentine hypersensitivity ($p=0.0011$).

Table 2 Presented the mean number of teeth with dentine hypersensitivity among different behavioral variables.

Variable	Category	Number	Percentage (%)	Mean	SD	F or T	p-value
Smoking	Current smoker	112	20.80%	1.65	2.869	1.17	0.310*
	Former smoker	58	10.80%	1.69	2.951		
	Non-smoker	368	68.40%	1.29	2.481		
Type of smoking	Cigarettes	97	61.80%	1.59	2.711	1.96	0.122*
	Hookah	31	19.70%	1.68	2.6		
	Smokeless tobacco	5	3.20%	0.8	1.789		
	Combinations	24	15.30%	3.13	4.327		
Brushing	Regular	327	63.60%	1.34	2.603	0.46	0.495**
	Irregular	187	36.40%	1.51	2.721		
Type of toothbrush	Soft	215	40.00%	1.13	2.394	1.81	0.163*
	Medium	262	48.70%	1.55	2.732		
	Hard	61	11.30%	1.62	2.818		
Brushing after meals	Yes	141	26.10%	1.26	2.528	0.55	0.457**
	No	399	73.90%	1.45	2.648		
Dental floss use	Yes	124	22.80%	1.52	2.67	0.59	0.422**
	No	419	77.20%	1.32	2.54		

Siwak use	Yes	180	36.40%	1.52	2.814	0.02	0.887**
	No	314	63.60%	1.48	2.485		
Use of desensitizing toothpaste	Yes	121	22.40%	1.96	2.954	7.78	0.005**
	No	420	77.60%	1.22	2.461		

*Using one-way analysis of variance; **Using independent samples t-tests

Table 3 presented the correlation between the number of teeth with dentine hypersensitivity and dietary behaviors of participants using the bivariate correlation coefficient (r). On average participants drank coffee and soda about 5-6 times per week, while they ate citrus fruits and seeds about two times per week. The correlation coefficient between dentine hypersensitivity and drinking soda and coffee, and eating citrus fruits, pickles and seeds ranged from 0.007 to 0.036, indicating no significant correlations.

Table 3 Presented a correlation coefficient between the mean number of teeth with dentine hypersensitivity and drinking and eating behaviors

Variable	N	Mean	SD	Correlation coefficient*	p-value
Times of drinking soda per week	529	4.81	4.11	0.036	0.409
Times of drinking coffee per week	529	6.27	4.84	0.018	0.685
Times of eating citrus fruits per week	526	2.54	2.32	-0.015	0.626
Times of eating seeds per week	497	1.6	2.51	0.007	0.873
Times of eating pickles per week	505	1.26	1.97	0.024	0.585

*Using correlation coefficient test (r)

The distribution of the number of teeth with dentine hypersensitivity among different medical conditions that might cause acidity in the mouth is presented in Table 4. The mean number of teeth with dentine hypersensitivity was higher in those with GERD compared to the normal population. The difference was statistically different ($p=0.006$). No differences in the mean number of teeth with dentine hypersensitivity were found among subjects with diabetes, anorexia or bulimia nervosa compared to normal subjects.

Table 4 Presented the mean number of teeth with dentine hypersensitivity among related medical conditions

Variable	Category	Number	Percentage (%)	Mean	SD	F ratio	p-value
GERD	Yes	40	7.7%	2.48	3.226	2.76	0.006*
	No	479	92.3%	1.29	2.548		
Diabetes	Yes	79	15.3%	1.59	2.835	0.91	0.366*
	No	438	84.7%	1.31	2.545		
Anorexia	Yes	33	6.4%	1.88	2.934	1.22	0.221*
	No	479	93.6%	1.31	2.561		
Bulimia Nervosa	Yes	5	1.0%	1.6	2.191	0.22	0.824*
	No	508	99.0%	1.34	2.591		

*Using independent samples t-tests

DISCUSSION

The study revealed that 4.8% of the total teeth examined were exhibiting dentine hypersensitivity. The mean number of teeth with dentine hypersensitivity per person averaged 1.39 teeth. Thus the tooth prevalence of dentine hypersensitivity was small. However, the percentage of persons with at least one tooth exhibiting dentine hypersensitivity was 33%, thus the person prevalence of dentine hypersensitivity was high. Comparisons of the prevalence of dentine hypersensitivity with other studies and among other nations should be considered with caution since dentine hypersensitivity depends on the presence of condition on either at the tooth level or personal level. No statistically significant associations were observed between the person prevalence of dentine hypersensitivity with different categories of demographic, behavioral, dietary and medical variables except with intermediate education and teeth brushing.

One of the limitations of this study included that sampling was not random. It was not feasible to do random sampling of adults due to difficulty in obtaining a national listing of all Saudi adults. Adult subjects were not readily approachable in Riyadh households may be because of social reasons. Since it was necessary to examine participants using dental units, the study participants were mainly dental patients who attended the College Dentistry for various reasons. No attempt was made to include or exclude any participants based on his/her dental complaints. Consequently, generalizing the result of this study to the general adult population in Riyadh city of Saudi Arabia should be taken into consideration. We have examined 547 subjects who were estimated by power analysis of sampling. It was not feasible in terms time and funding to expand the study to include more subjects. Another limitation of the study that the amount and the type of toothpaste used were not included in the questionnaire. This might have an implication with enamel abrasion in the cervical area when associated with tooth brushing.

The examiners of this study were three senior dental students who were trained in the assessment criteria of dentine hypersensitivity. A source of biased can be generated from inter-examiner variations in the clinical examinations, yet we had some measures to reduce this bias. All examiners were calibrated for a dental examination at the College of Dentistry clinic; as they were also from the same dental student batch and received similar dental training in the comprehensive care clinic. Inter-examiner reliability was checked using Kappa statistics.

The dentine hypersensitivity defined by the Canadian Consensus Document [1] as ‘pain derived from exposed dentin in response to chemical, thermal tactile or osmotic stimuli which cannot be explained as arising from any other dental defect or disease’. Based on this definition, and after careful examination of subjects who claimed dentine hypersensitivity, all other causes of pain were examined and investigated. Exclusion of teeth with tooth wear, caries, defected restoration and root exposure was considered before counting teeth with or without dentine hypersensitivity.

Since the person prevalence of dentine hypersensitivity reported by the patient usually based on the subjective symptom, and the prevalence was usually higher than expected [15], the diagnosis of dentine hypersensitivity in our study was based on a more objective measure which is based on clinical dental examination. We have used the information of dentine hypersensitivity reported by patients only to augment the clinical findings to have a more valid measurement of dentine hypersensitivity.

Upon reviewing the dental literature of studies conducted in Saudi Arabia related to the prevalence of dentine hypersensitivity, no such studies were found. Therefore, this study is the first to address the prevalence and risk indicators of dentine hypersensitivity among adults in Riyadh city. In addition, this study we have tried to include all possible risk indicators of dentine hypersensitivity that were extracted from published literature in our questionnaire and examination sheet. Therefore this study provided a more comprehensive picture of risk indicators of dentine hypersensitivity compared to other published articles.

The prevalence of dentine hypersensitivity in our study was 33.27% which is higher than that of Nigeria [5], UK [6], United States [16], and China [7], but lower than that of India [8], and Hong Kong [17]. The variation in dentine hypersensitivity among different nations might be explained by differences in the criteria of assessment (e.g. reported hypersensitivity vs. clinical examination) [18]. The difference might be a true difference due to different oral hygiene practices or dietary habits among different populations.

Our study did not find a significant relationship between the numbers of teeth with dentine hypersensitivity and demographic, behavioral and medical variable, except the presence of GERD and those using desensitizing agents. This could be explained either because of no relationship or because of the low prevalence of teeth with dentine hypersensitivity.

CONCLUSION

The tooth prevalence and person’s prevalence of dentine hypersensitivity among Saudi adults living in Riyadh, Saudi Arabia were 4.7 and 33%, respectively. No significant associations between demographic, behavioral, and medical conditions variable were observed with dentine hypersensitivity except for those who are using desensitizing agents and those suffering GERD condition.

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Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

- [1] Canadian Advisory Board on Dentin Hypersensitivity. "Consensus-based recommendations for the diagnosis and management of dentin hypersensitivity." *Journal of the Canadian Dental Association*, Vol. 69, No. 4, 2003, pp. 221-26.
- [2] Pashley, David H. "How can sensitive dentine become hypersensitive and can it be reversed?" *Journal of Dentistry*, Vol 41, No. 4, 2013, pp. 49-55.
- [3] Addy, Martin. "Dentine hypersensitivity: Definition, prevalence, distribution and aetiology." *Tooth Wear and Sensitivity*, 2000, pp. 239-48.
- [4] Gillam, D. G., and R. Orchardson. "Advances in the treatment of root dentine sensitivity: Mechanisms and treatment principles." *Endodontic Topics*, Vol. 13, No. 1, 2006, pp. 13-33.
- [5] Bamise, Cornelius T., et al. "The prevalence of dentine hypersensitivity among adult patients attending a Nigerian teaching hospital." *Oral Health and Preventive Dentistry*, Vol. 5, No. 1, 2007, pp. 49-53.
- [6] Rees, J. S. "The prevalence of dentine hypersensitivity in general dental practice in the UK." *Journal of Clinical Periodontology*, Vol. 27, No. 11, 2000, pp. 850-55.
- [7] Que, K., et al. "A cross-sectional study: non-cariou cervical lesions, cervical dentine hypersensitivity and related risk factors." *Journal of Oral Rehabilitation*, Vol. 40, No. 1, 2013, pp. 24-32.
- [8] Vijaya, V., et al. "Association of dentine hypersensitivity with different risk factors-A cross-sectional study." *Journal of International Oral Health*, Vol. 5, No. 6, 2013, pp. 88-92.
- [9] Orchardson, R., and W. J. N. Collins. "Clinical features of hypersensitive teeth." *British Dental Journal*, Vol. 162, No. 7, 1987, pp. 253-56.
- [10] Addy, M., and N. West. "Etiology, mechanisms, and management of dentine hypersensitivity." *Current Opinions in Periodontology*, Vol. 25, No. 12, 1994, pp. 71-77.
- [11] van Loveren, Cor. "Exposed cervical dentin and dentin hypersensitivity summary of the discussion and recommendations." *Clinical Oral Investigations*, Vol. 17, No. 1, 2013, pp. 73-76.
- [12] Leonard Jr, Ralph H., van B. Haywood, and Ceib Phillips. "Risk factors for developing tooth sensitivity and gingival irritation associated with nightguard vital bleaching." *Quintessence International*, Vol. 28, No. 8, 2013, pp. 527-34.
- [13] Bartlett, D. W., et al. "A study of the association between gastro-oesophageal reflux and palatal dental erosion." *British Dental Journal*, Vol. 24, No. 2, 1997, pp. 102-08.
- [14] Khocht, Ahmed, et al. "Gingival recession in relation to history of hard toothbrush use." *Journal of Periodontology*, Vol. 64, No. 9, 1993, pp. 900-05.
- [15] Fischer, C., R. G. Fischer, and A. Wennberg. "Prevalence and distribution of cervical dentine hypersensitivity in a population in Rio de Janeiro, Brazil." *Journal of Dentistry*, Vol. 20, No. 5, 1992, pp. 272-76.
- [16] Cunha-Cruz, Joana, et al. "The prevalence of dentin hypersensitivity in general dental practices in the northwest United States." *Journal of the American Dental Association*, Vol. 144, No. 3, 2013, pp. 288-962.
- [17] Rees, J. S., et al. "The prevalence of dentine hypersensitivity in a hospital clinic population in Hong Kong." *Journal of Dentistry*, Vol. 31, No. 7, 2003, pp. 453-61.
- [18] Colak, H., et al. "Prevalence of dentine hypersensitivity among university students in Turkey." *Nigerian Journal of Clinical Practice*, Vol. 15, No. 4, 2012, pp. 415-19.