



Dentine Hypersensitivity and its Quality of Life Impacts Among Libyan Adult Dental Patients in Benghazi

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**This Thesis Submitted in Partial Fulfillment of Requirement for
the Degree Of Master of Science In Oral Medicine**

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University of Benghazi Faculty of Dentistry



Department of oral medicine

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DECLARATION

I confirm that this thesis is a record of research carried out by myself, undertaken at the University of Benghazi. Except where otherwise stated the research design and analysis was my own work, subject to the help and advice received from those acknowledged. I have consulted all the reference cited. This research has not previously been submitted for a high degree.

Candidate

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LIST OF ABBREVIATION

Abbreviation	Full name
WHO	World Health Origination
DH	Dentine Hypersensitivity
DHEQ	Dentine Hypersensitivity Experience Questionnaire
OHRQoL	Oral Health Related Quality of Life
DMFT	decayed tooth, missing tooth, filled tooth
CPI	The WHO community periodontal index

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Abstract

There is a scarcity of research focusing on DH in the Arabic world.

To authors best of knowledge, no previous attempts have been made to assess the prevalence of DH among Libyan adults or to evaluate impacts of DH on the quality of life.

METHODS:

This study is a cross-sectional survey to explore the prevalence and associated factors of dentine hypersensitivity and its quality of life impacts among adult Libyan dental patients.

The study was conducted in the city of Benghazi which is the second largest city and the country and hosts nearly one million inhabitants who descend from different Libyan tribes and races. The participants, who were adult dental patient, were recruited from one main public clinic (Alsalmami) and two private dental practices during the period between August and September 2021.

A paper-based questionnaire was used to collect socio-demographic information (age, gender, education), oral health related behaviours (oral hygiene practices and preferences, smoking habits and dietary habits) and history of DH (time, duration and intensity of pain as well as aggravating and reliving factors).

Data was analysed using SPSS software.

All statistical test was conducted at p value of 0.05.

RESULTS:

Among 397 sample the distribution of DH cases. Overall, 31% of the participants had DH. However, most of the cases (80, 20.2%) were mild DH and the just 10 participants had DH.

The majority of DH patients presented with periodontal problems (84%), followed by toothache (19%) and check-up (11%).

The most common reliving factor was 'removing the cause' (13.9%) whereas the most aggravating factor was the cold drinks (21.4%).

Higher proportions of DH were observed among hard brush users and those who reporting using desensitising toothpaste.

($p \leq 0.05$)

CONCLUSION:

In Libyan dental practice, DH is a commonly presenting condition. It may disturb people during eating, drinking, and oral hygiene habits. The aetiology of DH, which is directly connected with dentine exposure, due to, mainly, cold, stimuli as well as periodontal diseases as a key predisposing factor that may play an important role in initiating this condition.

Chapter 1

INTRODUCTION

Dentine Hypersensitivity (DH) is a frequent, widely spread and painful oral condition. DH has been defined as “pain arising from exposed dentine in response to stimuli, typically thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other form of dental defect or pathology” (1). The pain is temporary and characterised by its brief and shooting nature with prompt response felt (2). Cold foods and drinks or cold air have pain identified as the most common evoking factors of DH, though hot, sweet or sour food stuff can evoke pain but often to a lesser extent (3). In addition, physical stimulation of dentine by pressure such as aggressive tooth brushing may also be a source of DH pain if the surface is compressed (4). Different terms have been used to describe dentin hypersensitivity, which are used according to the place of occurrence of hypersensitivity and include: cervical, root, dentine, cemental, and the terms sensitivity, and hypersensitivity convey the same clinical conception and can be used interchangeably (Table 1-1).

Table1 1 Common terms which are used refer to dentin hypersensitivity

- Dentin Hypersensitivity/ Sensitivity
- Dentinal Hypersensitivity/ Sensitivity
- Cervical Hypersensitivity/ Sensitivity
- Root Hypersensitivity/ Sensitivity
- Cemental Hypersensitivity/ Sensitivity

DH is caused by exposure of dentinal surfaces, and therefore, it should be differentiated from other types of tooth sensitivity that are caused by other

clinical conditions such as dental caries, microleakage, cracked tooth or fractured restorations (2, 5). The exposure of dentinal surfaces is generally caused by either loss of enamel or denudation of the root surface by loss of cementum and overlying periodontal structures(1). However, gingival recession leading to the denudation of the root surface is responsible for the majority of subjects to have exposed dentine. The management of DH is a challenging task for clinicians, which requires a detailed clinical and dietary history, to identify and manage etiological and predisposing factors (6, 7).

The pain arising from DH can be significant enough to affect a patient's quality of life . Quality of life (QoL) concerns have historically been regarded as secondary to clinical outcomes when evaluating if a treatment has been a success. Increasingly however, attention is paid to the patient's own thoughts and feelings regarding treatment options and the impact an oral condition may have on their life (8, 9). DH is a relatively common dental problem, that may heavily impact the functional and psychosocial of living. Besides discomfort caused by dental pain, affected patients may tend to change their dietary and oral hygiene habits in order to cope with such unpleasant experience. Therefore, patient's perspective is not only important for making the right diagnosis of DH (10), but also to evaluate the effectiveness of treatment. In response to the urgent need of adopting patient-centered approach when dealing with DH, Dentine Hypersensitivity Experience Questionnaire (DHEQ) has been

developed to specifically measure oral health related quality of life impacts of DH. DHEQ was found to be a reliable and valid measure of the experience of DH (11). A short form (DHEQ-15) has also been developed, which also displayed excellent psychometric properties (12). The original DHEQ-15 is developed in English-language, and consists of 15 items with coded responses on a 7-point Likert scale labelled and scored as; Strongly agree (7), Agree (6), Agree a little (5), Neither agree or disagree (4), Disagree a little (3), Disagree (2) or Strongly disagree (1). Total DHEQ impact score is simply calculated by summing up responses for the 15 items. Scores can range from 15-105. A higher score means more impacts of dentine hypersensitivity on everyday life (i.e. worse dentine hypersensitivity-specific quality of life) (12).

The quality of life of people with DH is often altered, because the pain experienced with DH causes tangible and frequent discomfort. Recent studies indicate that members of the Western population retain their functional natural dentition longer than previous generations, resulting in continued tooth wear (9). Given these demographic and health trends, it is likely that DH will become a more frequent dental finding in the future. Thus, the condition needs to be diagnosed and addressed at an early stage, or indeed prevented, to reduce lifelong oral pain symptoms associated with DH.

There is a scarcity of research focusing on DH in the Arabic world. Searching PubMed revealed a few studies assessing the prevalence of DH

among Jordanian and Emirati adults, which was relatively high (around 28%) (13, 14). To authors best of knowledge, no previous attempts have been made to assess the prevalence of DH among Libyan adults or to evaluate impacts of DH on the quality of life.

CHAPTER 2

LITERATURE REVIEW

2.1 Clinical Presentation

DH is defined as a “short, sharp pain arising from exposed dentine in response to stimuli, typically thermal, evaporative, tactile, osmotic, or chemical, which cannot be ascribed to any other form of dental defect or pathology.” (15). Classically, the pain experienced with DH is of rapid onset, short and sharp in character, and of a duration equal to that of the applied stimuli, although it can persist as a dull throbbing ache for variable periods. It may be localized or generalized, affecting one or more tooth surfaces simultaneously (16).

2.2 Differential Diagnosis of DH

The definition of DH has two aspects. While the first is a clinical description of condition, the second, identifies DH as a distinct clinical entity and therefore the clinician should consider a differential diagnosis, to rule out other conditions may have matching symptoms but require different management strategies (Table 2-1) (16). Therefore, it is necessary to take the proper time to make a correct diagnosis, because DH is always a diagnosis of exclusion; it can only be definitively confirmed after all other possible conditions have been diagnostically eliminated. A proper history of the nature of the pain, clinical evaluation, and radiographic examination, as well as the use of diagnostic tests (such as percussion, palpation, and pulp-vitality testing) will allow the clinician to confirm DH by excluding other conditions.

Table 2.1 Possible causes of tooth sensitivity that do not represent DH

- Dental caries
- Chipped teeth
- Fractured teeth
- Fractured restorations
- Cracked tooth syndrome
- Postoperative sensitivity
- Pulpal response to caries and to restorative treatment
- Pulpitis or other endodontic problems
- Ditching of margins of amalgam restorations and surface wear on composites
- Improperly insulated metallic restorations
- Incorrect placement of dentine adhesives in restorative dentistry leading to nano-leakage
- Palato-gingival groove
- Vital bleaching procedures
- Acute hyperfunction of teeth
- Atypical facial odontalgia
- Hypoplastic enamel
- Congenitally open cementum_enamel junction

However, for research purposes, DH is diagnosed as

2.3 Etiology and risk factors of DH

Although it is not clear which are key factors to the development of DH, many risk factors have been recognised that lead to the exposure of dentine and subsequent DH, however, (17). DH is a multifactorial condition that involves interactions between several factors, for which two processes must occur to develop. (18) First, the dentine surface of the tooth has to become exposed (lesion localization); second, a number of dentinal tubules in close proximity to each other have to be opened and must be patent from the pulp to the oral

environment (lesion initialization)(18). Exposure of dentine may be the result of enamel loss or gingival recession. Dentin exposure can be caused by physical, chemical, pathological, biological challenges and/or developmental abnormalities that increased dentine wear and tubule exposure often being the result of the synergistic effects of erosion and abrasion.(19) Various clinical conditions thought to play a role in the development of DHS include enamel attrition and erosion, abrasion and abfraction (20).

Attrition is the loss of tooth hard tissues due to tooth to tooth contact during normal or parafunctional masticatory activity. Abrasion, on the other hand, is the pathological wear of tooth, caused by biomechanical frictional processes of external objects (e.g., toothbrushing). The use of abrasive toothpastes and hard tooth brush may abrade dentine, and therefore, have been recognised as potentially responsible for lesion development (16).

Dental erosion is defined as chemical wear as the result of extrinsic or intrinsic acid or chelators acting on plaque-free tooth surfaces.⁴³ It is characterized by initial softening of the enamel surface and is followed by continuous layer-by-layer dissolution, leading to permanent loss of tooth volume and leaving a softened layer at the surface of the remaining tissue. In advanced stages, dentine becomes increasingly exposed. Extrinsic acid exposure is associated with dietary acids, such as citrus fruits, pickled food, fruit juices, carbonated drinks, wines and ciders, and others. Intrinsic acids are associated

with eating disorders and mainly comprise gastric acid, which moves to the oral cavity as a result of gastroesophageal reflux, vomiting syndromes (such as bulimia), or from vomiting caused by drugs that act as irritants to the gastric mucosa. When erosion is caused by gastric regurgitation, the palatal aspects of the upper incisors and the occlusal and buccal aspects of lower posterior teeth are primarily affected (21).

Abfraction is the microstructural loss of tooth substance in areas of stress concentration. This loss occurs most commonly in the cementoenamel region of teeth, where flexure may lead to a breaking away of parts of the thin layer of enamel rods, as well as microfracture of cementum and dentine. Such lesions, when observed on a single tooth or on nonadjacent teeth, are hypothesized to be the result of eccentrically applied occlusal forces (e.g., during grinding, clenching, temporomandibular disorders that lead to tooth flexure rather than to be the result of abrasion alone (22).

Periodontal tissue loss or gingival recession is another major predisposing factor since this is the most common cause of exposing radicular dentine. Other factors, such as aging, soft tissue dehiscence, including aggressive brushing, can also cause apical displacement of the gingival margins thereby leading to exposure of dentin that can ultimately lead to the development of DH (23). Gingival recession means the displacement of the gingival margin apical to the cementoenamel junction, thereby exposing visible cementum of the root surface

which is responsible for a much greater dentine area of exposure than cervical enamel loss (24). Consequently, dentinal tubules become extensively exposed, because the cementum layer is thin and easily removed. Gingival recessions appears to be multifactorial which can be caused by periodontal disease, dehiscence and fenestration of alveolar bone, trauma, orthodontic therapy, oral piercing, self-inflicted injury, and traumatic toothbrushing (25).

2.4 Mechanism of DH

Three theories have been used to explain the mechanisms of DH: the dentinal receptor theory; the odontoblastic transduction theory; and the hydrodynamic theory. All three are intimately related to the structure of the dentine-pulpal complex(16). Dentine is a porous, mineralized connective tissue with an organic matrix of collagenous proteins and an inorganic component, hydroxyapatite. Dentine is highly permeable, mainly because of the presence of numerous dentinal tubules that extend from the pulp to the dentine-enamel junction and are surrounded by hyper-mineralized tissue (known as peritubular dentine). The dentinal tubule contains serum-like fluid and an odontoblast cell process (26).

Three main mechanisms of dentin sensitivity are proposed to explain DH (27). The most widely accepted mechanism for DHS has been the hydrodynamic theory which states that environmental, mechanical, thermal, and chemical changes cause the movement of fluid within dentinal tubules, and

eventually stimulate the terminals of pulpal nerve fibers located within the tubule walls, thereby inducing transient acute pain (28).

The hydrodynamic theory highlights the concept that a number of different stimuli can evoke similar responses resulting in the characteristic short, sharp pain. Evaporative, thermal and osmotic stimuli are thought to increase the outward flow of tubular fluid, whereas mechanical stimuli such as toothbrush are thought to compress the surface tissue, with the expansion upon release triggering an increase in outward flow of fluid (29). The understanding of the hydrodynamic mechanisms of DH provides a basis for developing desensitizing therapies.

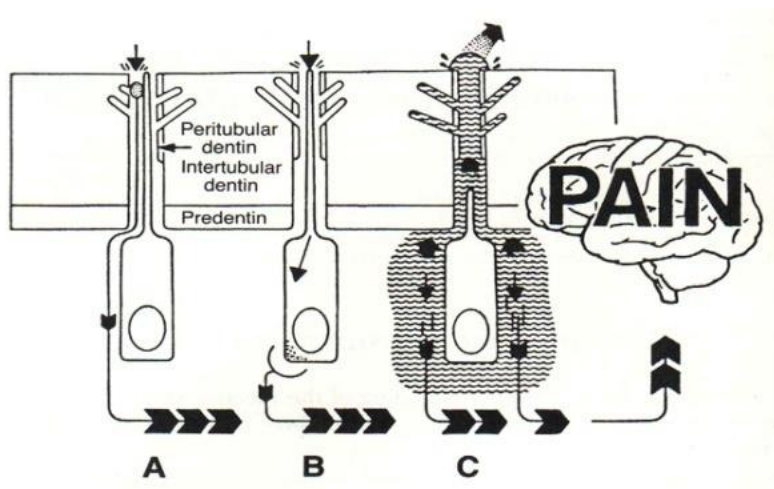


Figure 2-1: Mechanism of DH theories (29).

The dentinal receptor theory was one of the early hypotheses about the mechanisms of DH. It implied that DH is caused by the direct stimulation of the nerve endings in dentine. However, based on experimental studies, it seems unlikely that neural cells exist in the sensory portion of the outer dentine,⁵⁰

discounting this early theory (7). The odontoblastic transduction theory proposed by Rapp assumed that odontoblasts extend to the peripheral dentine, with any odontoblastic processes exposed at the dentine surface being susceptible to excitation by chemical and mechanical stimuli (16). However, microscopic experiments failed to confirm this concept. The majority of studies have shown that odontoblasts are matrix forming cells and hence they are not considered to be excitable cells, and no synapses have been demonstrated between odontoblasts and nerve terminals (30).

2.5 Management of DH

DH is mainly a diagnosis of exclusion of pathological causes. Thus, differential diagnostic aspects play a pivotal role and a thorough history taking and clinical evaluation is indispensable to identify etiological and pathogenic factors. A number of other conditions causing dentin exposure, dental pulp hyperemia, dental nerve sensitization and neuropathy may induce similar symptoms of DH (31). Deep dental caries, reversible pulpitis can induce DH like pain and therefore ruling out caries-related pain in the differential diagnosis of DH is important (32). Other conditions that may present similar symptoms of DHS include cracked teeth, defective or fractured restorations, tooth preparation for restorations or restoration-induced pulp hyperemia, tooth whitening, dental trauma, occlusal trauma, cervical plaque and gingivitis, periodontal disease and its treatment, and other dental pulp/endodontic problems (33).

The proposed protocols for differential diagnosis of DHS include chief complaint and symptom inquiry, present illness history review, clinical exam and diagnostic testing. Regarding diagnostic testing, one of the most reliable outcomes would result from stimulating the involved tooth using a triggering stimulus reported by the patient, verifying that the patient's chief pain complaint can actually be triggered (34).

The management of DH can be generally divided into self-performed therapy at home or professionally applied, and these include: 1) Oral hygiene education and brushing technique instruction for prevention of DH; 2) Behavioral control and elimination of predisposing factors for DH; 3) Non-invasive treatments for pain relief through occluding dentin tubules and blocking nociceptive transduction/transmission. 4) Restoration or surgical treatments for dental hard and soft tissue defects (35).

The application of desensitizing agents is the most frequently used treatment for DH. This will suppress nerve impulses by either mechanical or chemical blockage of the dentin tubules or by directly stopping the nociceptive transduction/transmission occurred within dentin-odontoblasts-nerve terminal complex of the dental pulp. Based on the mode of their administration, the desensitizing treatment can also be classified into at-home therapy or in-office therapy categories (35).

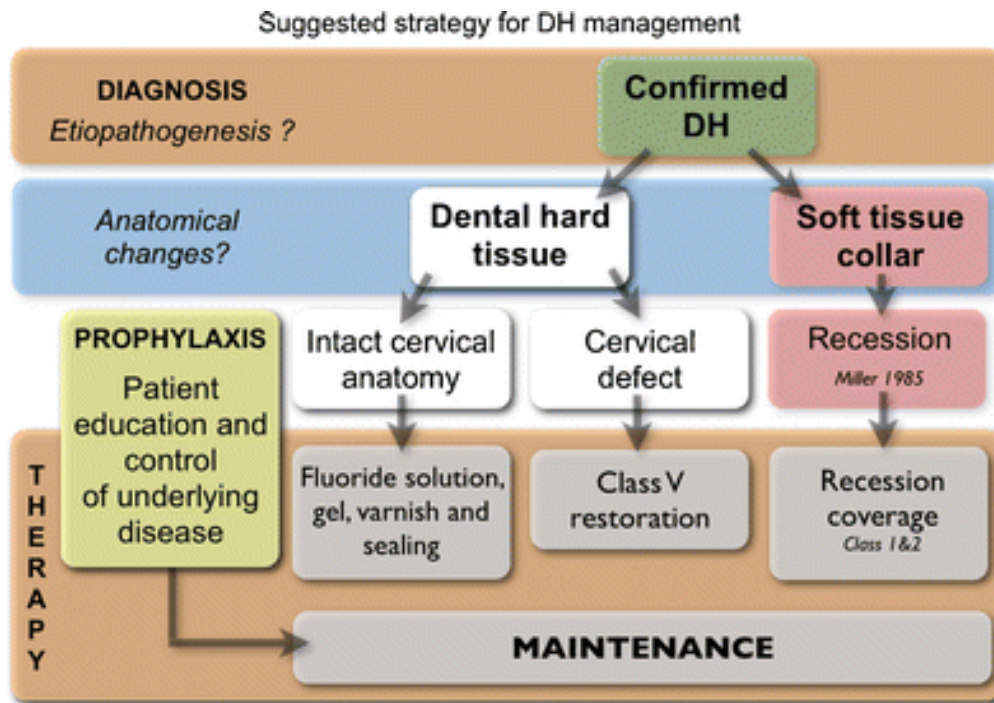


Figure 2-2: Flow chart of DH management (35)

2.6 Prevalence of DH

The prevalence of DH across the globe has been reported with a varying range between 1.34% and 98%, that reflects the variety in the data collection techniques and the diversity of the cohorts studied (36, 37). Although most DH prevalence studies were conducted in developed world, studies in less well-developed countries have also been undertaken. A 2016 study in India was conducted using both a verbal rating scale and questionnaire to quantify the patient's own perceptions of DH before moving on to a clinical evaluation. A total of 404 patients were assessed firstly with a scratch on the tooth surface performed with a dental instrument. This was followed by a 10-minute wait

before the reaction to a cold air blast was scored. 20.6% of the participants subjected to these tests were confirmed to have hypersensitive dentine (38).

It is important to include both self-reported and clinical measures to assess DH. A study of patients attending a dental clinic in the city of Rio de Janeiro, Brazil requested that patients self-report DH via a questionnaire and 25% out of a total of 635 subjects screened stated they have DH. However, when subjected to clinical tests involving cold air blasts and tactile feedback from scratching with a probe the pervasiveness of DH was found to be 17% (39).

The variations in prevalence rates for DH can be explained by the survey methods used, the population studied and the socio-economic condition of the region or country under investigation. Diversity in national or regional economic development, a populations diet, oral hygiene standards and attitudes towards oral disease will all contribute to the different prevalence rates documented for DH(40). In countries where gingival recession is on the increase the numbers of people suffering with DH are likely to follow. This can be as a result of excessive or forceful tooth brushing particularly when combined with a modern acid containing diet (41).

The wide range of prevalence figures found for DH is matched by the wide range of diagnostic techniques, study designs and populations studied. However as stated above this study notes that DH is a diagnosis of exclusion

therefore conditions that mimic DH must be ruled out. Studies which exclusively rely on a questionnaire model are also open to interpretation as the patient's own perception is relied upon, opening up the possibility that pain is reported as DH where in fact it is due to any other pathology. Prevalence rates in questionnaire studies have been found to report levels of DH as high as 57.2% (42).

2.7 Oral Health Related Quality of Life and DH

Oral Health Related Quality of Life (OHRQoL) is a patient centered approach of health needs assessment, that is increasingly used to investigate the psycho-social impact of oral health, with several applications in clinical practice, population needs surveillance and services planning and evaluation (43-47). In response to the urgent need of adopting a patient-centered approach when dealing with DH, the Dentine Hypersensitivity Experience Questionnaire (DHEQ) has been developed to specifically measure oral health related quality of life impact of DH. Although the DHEQ has been found to be a reliable and valid instrument to measure the experience of DH (48), a short form (DHEQ-15) has also been developed and subsequently demonstrated excellent psychometric properties (12). The advantages of having short forms of OHRQoL measures are that they are easy to deliver (e.g. shorter time), easy to fill and interpret, and hence they can be a cost-effective tool for data collection, particularly in population surveys (49).

In a systematic review of literature to examine if DH treatments are able to improve individuals' oral health related quality of life (OHRQoL), data from PubMed/MEDLINE, Scopus, Web of Science, Cochrane Library, LILACS, EMBASE and Scielo databases , were searched until May 2017. In addition, hand searches and grey literature were included. Six clinical trials were included. DH was assessed by evaporative, cold, and tactile stimuli. OHRQoL was evaluated by OHIP-14 and DHEQ questionnaires. In-home and in-office desensitizing agents for DH treatment were used. The revised studies reported statistically significant reduction of DH and significant improvement in quality of life after treatment ($p < 0.05$). The evidence was very low to moderate. The authors concluded that the studies indicated decreasing of DH and improving of OHRQoL after DH treatment, although, they presented low to moderate methodological quality (50).

2.8 Summary

In summary, DH is a commonly presenting condition in dental practice which may negatively affect the quality of life by disturbing eating, drinking, and oral hygiene habits of individuals. The etiology of DH, which is directly connected with dentine exposure, is multifactorial; however, interactions between several factors, including stimuli as well as predisposing factors, may play an important role in initiating this condition. The most current theory regarding the physiological mechanism responsible for the pain associated with

DH is the hydrodynamic theory. This theory suggests that fluids within the dentinal tubules become disturbed by temperature, physical, or osmotic changes, subsequently triggering a response in the pulp nerves that leads to a neural pain signal. The pain experienced by people with DH can cause such discomfort that it interferes with daily activities. The diagnosis of DH is made by exclusion of other pathological causes. The diagnosis can be made by self-reported measures or through clinical testing. The epidemiology is widely varied. However, to authors best of knowledge, no previous studies have investigated the prevalence of DH in Libyan population.

Chapter 3

AIMS AND OBJECTIVES

3.1 Aim:

to describe the distribution and impacts of DH among Libyan adult dental patients

3.2 Objectives

1. To describe the prevalence of DH among Libyan adult dental patients
2. To describe risk factors associated with DH among Libyan adult dental patients
3. To describe the quality of life impacts of DH using Arabic version of DHEQ15

Chapter 4

METHODS AND SUBJECTS

4.1 Study Design:

This study is a cross-sectional survey to explore the prevalence and associated factors of dentine hypersensitivity and its quality of life impacts among adult Libyan dental patients.

4.2 Setting and Participants

The study was conducted in the city of Benghazi which is the second largest city and the country and hosts nearly one million inhabitants who descend from different Libyan tribes and races. The participants, who were adult dental patient, were recruited from one main public clinic (Alsalmani) and two private dental practices during the period between August and September 2021. The public clinic was the largest in the city of Benghazi with large patients' flow and provided a range of dental services including secondary and tertiary levels of care. The two private clinics were group practices which is considered among the most popular practices in the city of Benghazi. A convenience sample of at least 384 participants was deemed appropriate to estimate the proportion of patients with DH at 95% confidence level and 0.05 margin of error. The sample was recruited from dental patients who fulfilled following inclusion criteria:

- Libyan nationality
- Aged 18-70 years of age

- Able to provide informed consent

The participants were approached by the principal investigator who explained the aim of the study and requested verbal consent to use patients' data for research purpose.

4.3 Data collection

The data was collected using both paper-based questionnaires and clinical examination to diagnose DH and assess its impact on OHRQoL.

4.3.1 Questionnaire:

A paper-based questionnaire was used to collect socio-demographic information (age, gender, education), oral health related behaviours (oral hygiene practices and preferences, smoking habits and dietary habits) and history of DH (time, duration and intensity of pain as well as aggravating and relieving factors). The questionnaire also included questions on medical condition that could have influence on the dentition status such as Gastro-oesophageal reflux disease (GERD), gastritis, vomiting, diabetes, eating disorder, and pregnancy. Dental visit and Chief complaint histories were also obtained. The questionnaire comprised of both close-ended and open-ended questions. The questionnaire was developed from previous studies that investigated the prevalence and risk factors of DH and was pre-tested for clarity and relevance among 20 dental patients.

The questionnaire was completed in the waiting room by two trained investigators who interviewed the participants and provided explanation of questions and ensure including illiterate participants.

4.3.2 Clinical examination:

All clinical examinations were carried out in dental clinical setting, using dental chair light, dental mirror, explorer and periodontal probe. Patients were assessed for their caries experience and periodontal health status according to the World Health Organization (WHO) diagnostic criteria and using oral examination form for data collection (51). Caries experience was assessed using DMFT index (D: decayed tooth, M: missing tooth due to decay and F: filled tooth). The WHO community periodontal index (CPI) was used to assess periodontal status by measuring bleeding, periodontal pocket and loss of attachment that met the WHO scoring criteria summarized in table 4-1 (51).

For pocket and loss of attachment assessment, the mouth divided into six parts (sextants) only six teeth are examined (17/16, 11, 26/27, 36/37, 31, 46/47), The two molars in each posterior sextant were paired for recording and, if one is missing, there is no replacement. If no index tooth is present in a sextant qualifying for examination, all the teeth that are present in that sextant are examined and the highest score is recorded as the score for the sextant. When the probe is inserted, the ball tip should follow the anatomical configuration of the surface of the tooth root and should be inserted gently into the gingival

sulcus or pocket and the full extent of the sulcus or pocket explored. To diagnose gingivitis, the gingiva is assessed by carefully inserted the tip of the WHO (CPI) probe between the gingival and the tooth to assess absence or present of bleeding response.

Table 4-1 The diagnostic criteria used in DMFT index

Decayed tooth	Caries is recorded as present when a lesion in a pit or fissure, or on a smooth tooth surface, has an unmistakable cavity, undermined enamel, or a detectably softened floor or wall. A tooth with a temporary filling, or one which is sealed but also decayed, should also be included in this category. In cases where the crown has been destroyed by caries and only the root is left therefore scored as crown decay.
Filled tooth	A crown is considered filled, without caries, when one or more permanent restorations are present and there is no caries anywhere on the crown. A tooth that has been crowned because of previous decay is recorded in this category.
Missing tooth	Missing tooth, due to caries. This code is used for permanent teeth that have been extracted because of caries and are recorded under coronal status.

4.3.3 Diagnosis of DH

The teeth were diagnosed as presenting DH by clinical examination and history taking. DH was diagnosed if 1) the patient reported pain on eating, drinking, or toothbrushing , and 2) presented an exposed dentin surface on the affected tooth, and 3) absence of any other tooth pathology could may explain the pain.

Dentine hypersensitivity was diagnosed based on clinical stimulation of DH by passing dental explorer on all teeth facial surfaces as well as the application air of blast from three-in-one syringe connected to the dental unit. The resulting pain was scored by Schiff cold air scale which was scored as follows:

0 – Subject did not respond to air stimulus.

1 – Subject responded to air stimulus but did not request discontinuation of stimulus.

2 – Subject responded to air stimulus and requested discontinuation or moved from stimulus.

3 – Subject responded to air stimulus, considered stimulus to be painful and requested discontinuation of the stimulus.

Teeth were excluded if they were sensitive due to causes other than erosion, abrasion, or recession of exposed dentine. These include causes of pain include chipped or fractured teeth, cracked cusps, carious lesions, leaky restorations and palate-gingival grooves. Teeth extensively restored or restored

in the preceding three months and abutment or crowned teeth for fixed or removable prostheses were excluded from the diagnosis. The root surfaces that were exposed in examined teeth and erosion were also excluded of the diagnosis.

4.3.4 Calibration of examiners

Training and calibration of examiners were carried out before commencing the study. This involved discussions with the supervisor and examinations of 10 dental patients which was accompanied by discussion to reach agreement on diagnostic criteria which was 99%.

4.4 Ethical consideration

Ethical approval was sought from ethics committee at the faculty of dentistry, university of Benghazi. Permissions to conduct the study were obtained from each research site. The participants were informed about the aim of the study and verbal consent was obtained.

4.5 Statistical analysis

Data was analysed using SPSS software. Descriptive statistics were used to describe the characteristics of study participants. Numbers and percentage were used to describe the distribution of participant's characteristics and behaviours and the prevalence of DH, caries and periodontal diseases. Comparison of the prevalence of DH according to behaviors and oral health

status and social class were carried out using chi-squared test. All statistical test was conducted at p value of 0.05.

Chapter 5

RESULTS

5.1 Sample profile

Table 5-1 shows the distribution of sample profile. The participants were Libyan adults aged between 18 and 70 years. The majority were females (237, 59.7%), University educated (57.4%) and most of them were recruited from public clinics (91.7%).

5-1 Sociodemographic characteristics of study sample

Variable		
Age	Mean \pm SD	35.34 (10.89)
	Min-Max	18-70
		N (%)
Gender	Male	160 (40.3)
	Female	237 (59.7)
Education	Less than University	169 (42.6)
	University or higher	228 (57.4)
Clinic type	Public clinic	364 (91.7)
	Private clinic	33 (18.3)

5.2 Prevalence and distribution of DH

Figure 5-1 shows the distribution of DH cases. Overall, 31% of the participants had DH. However, most of the cases (80, 20.2%) were mild DH and the just 10 participants had DH. Figure 5-2 demonstrated that most affected

teeth were in the lower anterior sextant (20.1%) and the upper anterior sextant (15.4%).

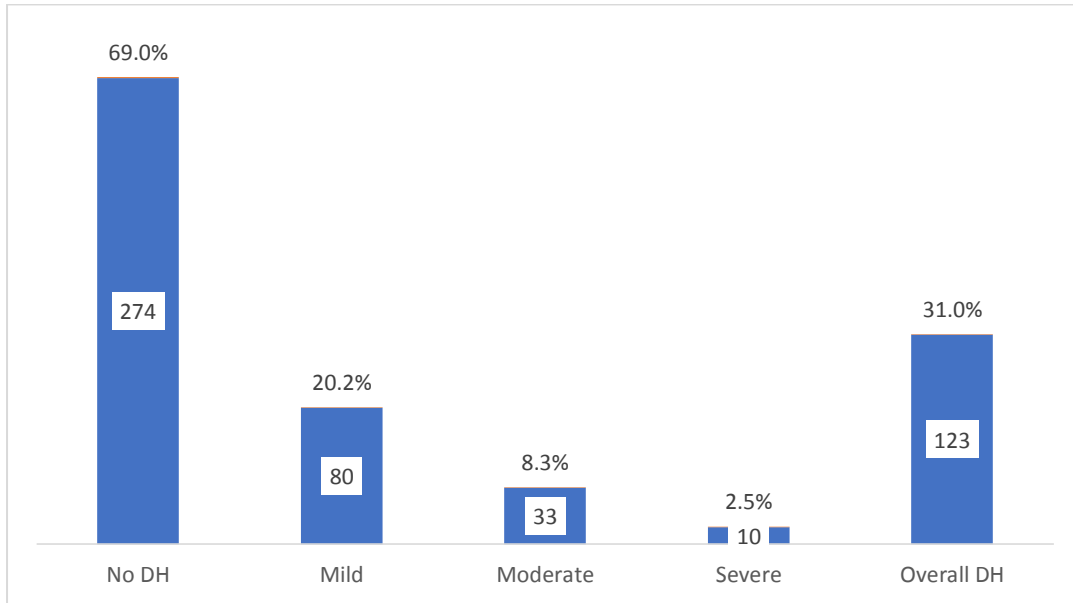


Figure 5-1: Prevalence of DH

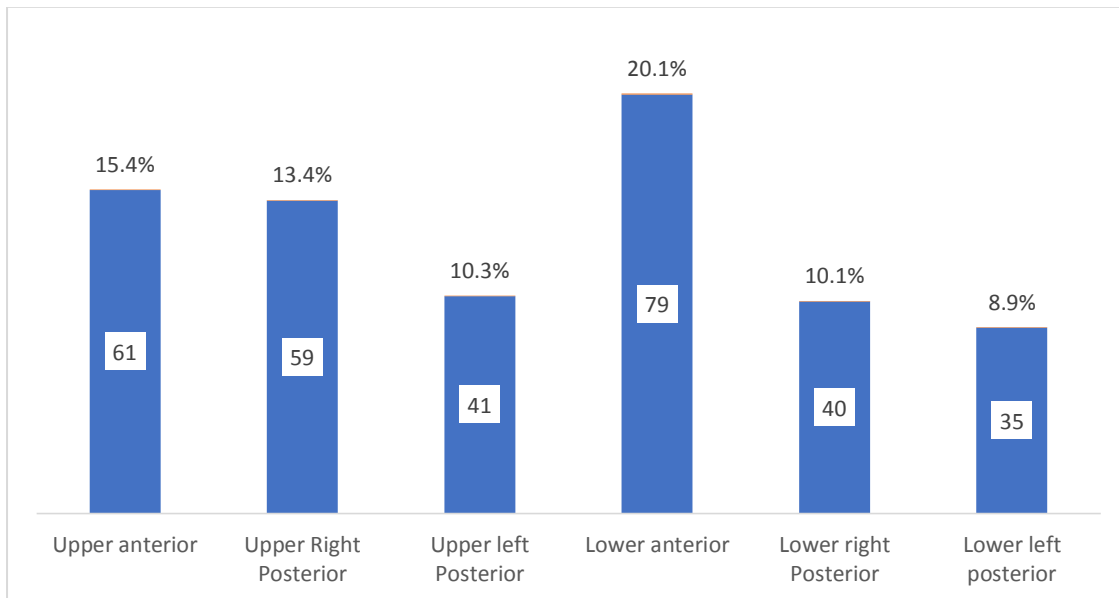


Figure 5-2: Prevalence of DH by sextant

Figure 5-3 shows the distribution of DH by chief complaint. The majority of DH patients presented with periodontal problems (84%), followed by toothache (19%) and check-up (11%). Six patients complained of DH. The toothache was noted within last years mainly and few participants reported pain in recent weeks (Figure 5-4).

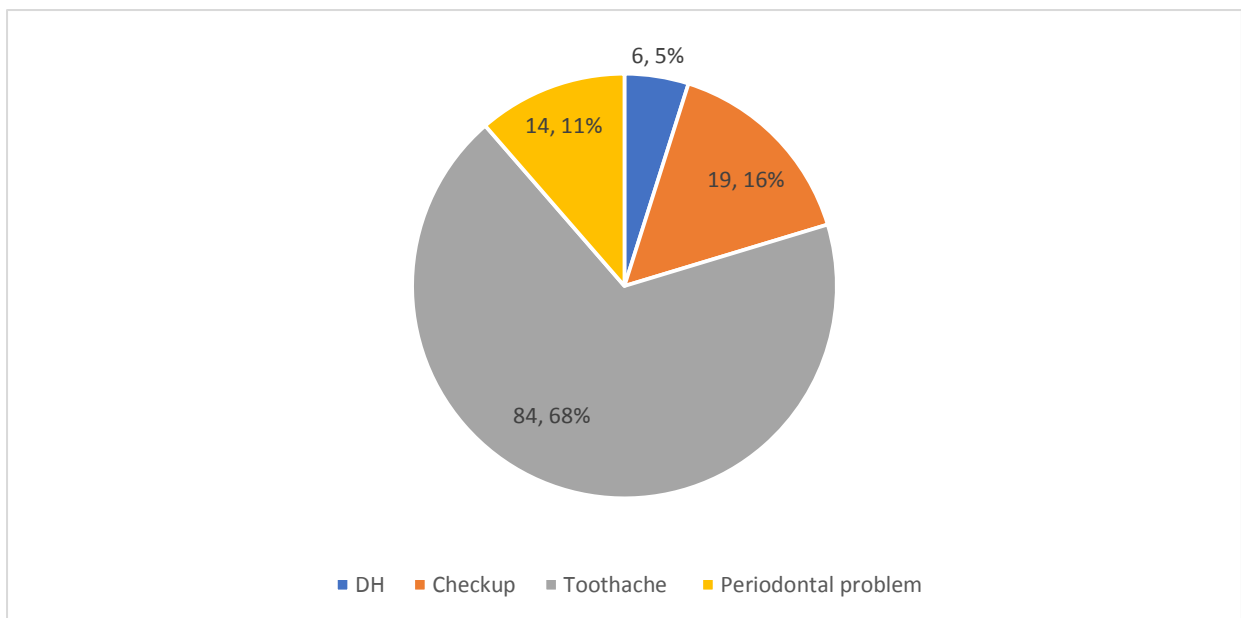


Figure 5-3: Chief complaints of DH patients

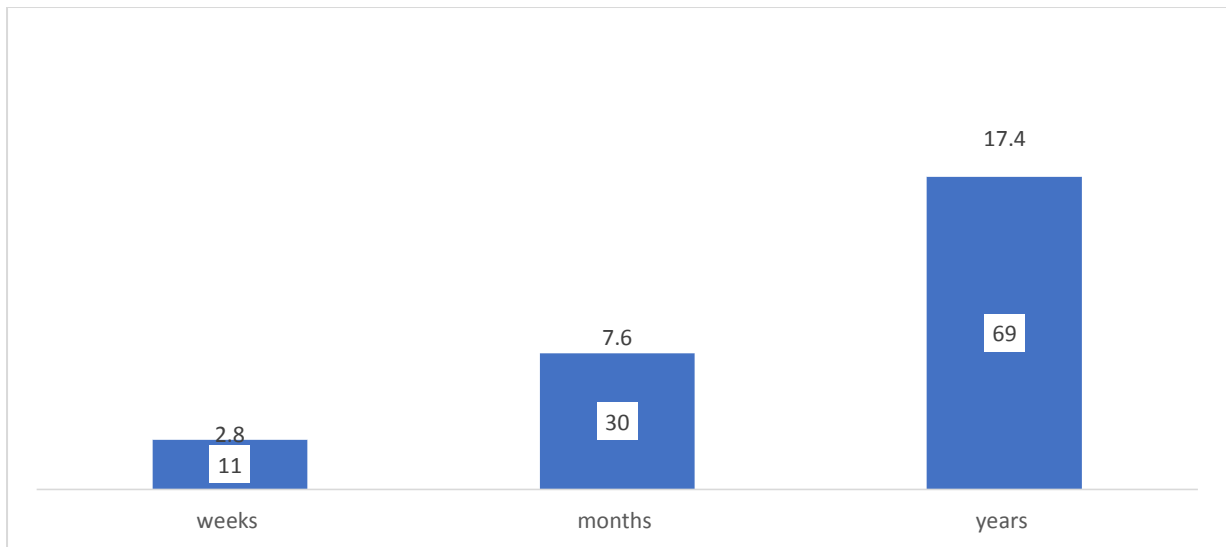


Figure 5-4: Time since pain started

Aggravating and reliving factors of DH are presented in figures 5-4 and 5-6. The most common reliving factor was 'removing the cause' (13.9%) whereas the most aggravating factor was the cold drinks (21.4%).

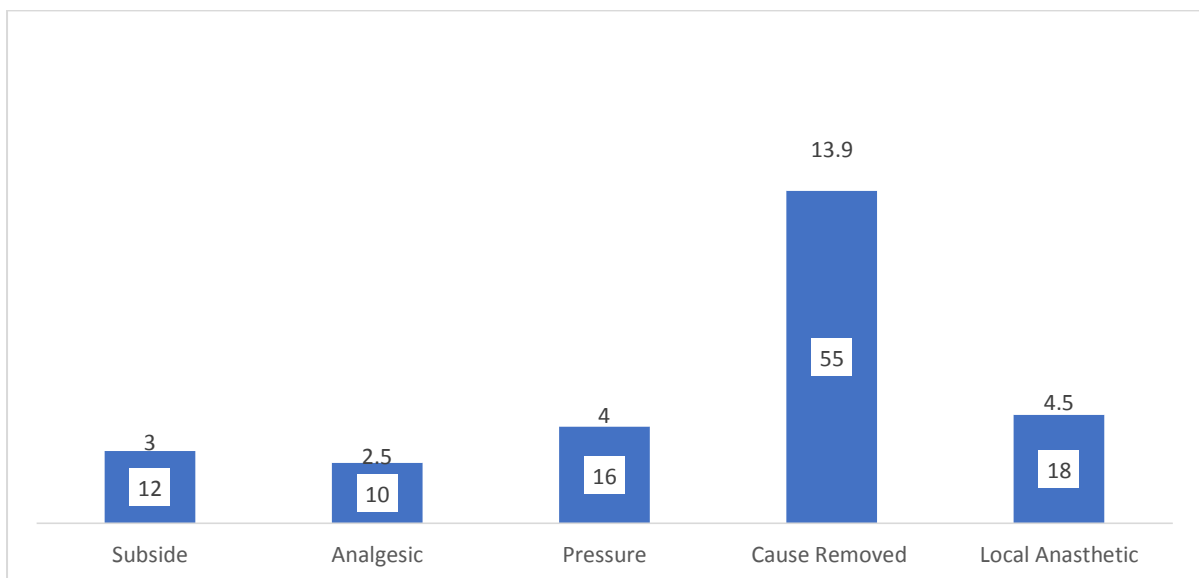


Figure 5-5: Relieving factors of DH

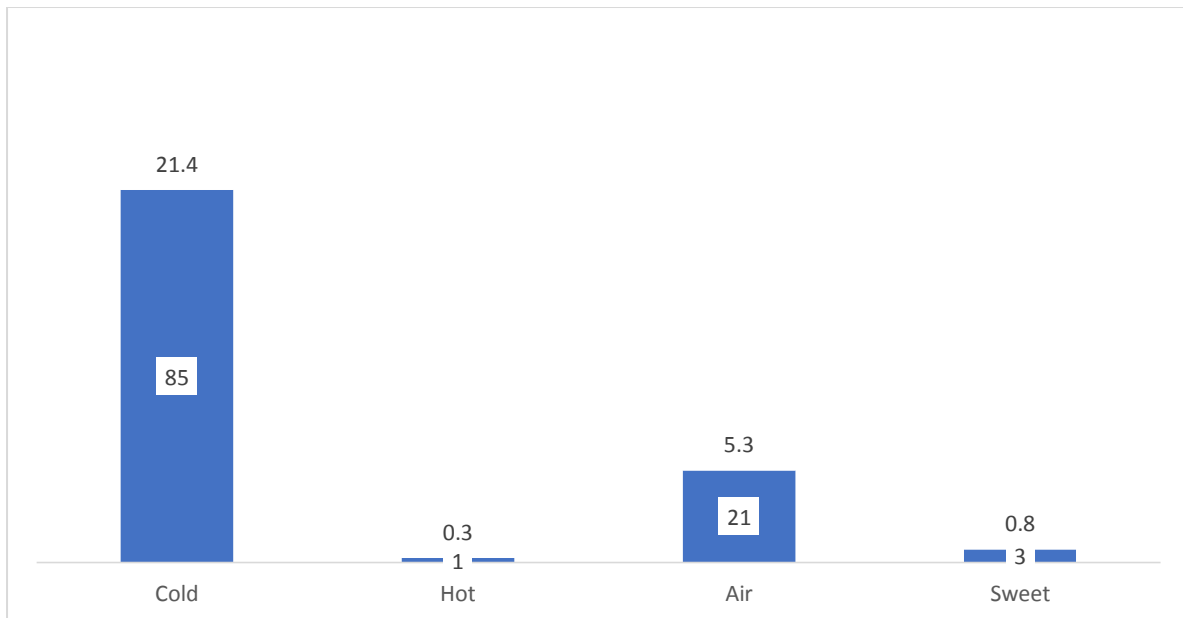


Figure 5-6: Aggravating factors of DH

5.3 Comparison of demographic and behaviour risk factors of DH patients

Table 5-2 shows comparison of demographic characteristics of DH patients (n=123). No statistically significant differences were observed. Table 5-3 shows comparison of oral hygiene related behaviours of DH patients (n=123). The statistically significant differences were observed by participants' use of desensitising toothpaste (0.006) and the type of brush bristles (0.015). higher proportions of DH were observed among hard brush users and those who reporting using desensitising toothpaste. No significant differences were reported when DH compared by the self-reported dietary habits.

Table 5-2: Socio-demographic characteristics of DH patients

Variable		DH	P value
Gender	Male	47 (29.4)	0.145
	Female	76 (32.1)	
Education	Less than University	59 (34.9)	0.469
	University or higher	64 (28.1)	
Clinic type	Public clinic	115 (31.6)	0.179
	Private clinic	8 (45.3)	

Chi-squared test was used to compare subgroups at $p \leq 0.05$

Table 5-3: Oral health behaviours of DH patients

Variable		DH patients (n=123)	P value
Toothbrushing frequency	Never/irregular	15 (30.6%)	0.952
	Regular	108 (31%)	
Interdental flossing	Never/irregular	103 (29.9)	0.211
	Regular	20 (38.5)	
Mouth rinsing	Never/irregular	104 (30.1)	0.299
	Regular	19 (37.3)	
Type of brush	Electric	2 (33.3%)	0.342
	Manual	110 (30.2)	
	Both	6 (49.1)	
Type of bristles	Hard	11 (57.9)	0.015*
	Medium	54 (26.7)	
	Soft	53 (32.9)	
Use Sewak	Never/irregular	98 (29.6)	0.158
	Regular	25 (38.5)	
Desensitizing toothpaste	Yes	37 (43%)	0.006***
	No	81 (27.5%)	
Fizzy drinks	Never/irregular	71 (32.3%)	0.276
	Regular	52 (28.2%)	
Citric foods	Never/irregular	106 (31.3%)	0.776
	Regular	17 (29.3%)	
Coffee and tea	Never/irregular	31 (30.6%)	0.251
	Regular	92 (29.6%)	
Ice-cream	Never/irregular	113 (30.7%)	0.672
	Regular	10 (34.5%)	

Chi-squared test was used to compare subgroups at $p \leq 0.05$

5.4 Quality of life impacts of DH

The impact of DH on OHRQoL is demonstrated in table 5-4 and figure 5-7. The data shows that DH had varying impacts on different items of DHEQ15. The highest impacts were related to taking longer time to finish food (43.7%), feeling older (40%) and hinders the visit to the dentist (37.6%). On the other hand, the least impacts were on eating the ice-cream (10%) and feeling uncomfortable (11.9%).

Table 5-4: Summary of responses to DHEQ15 items

DHEQ Item	Strongly agree	Agree	Slightly agree	Indifferent	Slightly Don't agree	Don't agree	Strongly Don't Agree
الشعور بحساسية في أسناني يقلل كثيرا من الاستمتاع بالاكل والشرب	3.0	6.9	3.0	1.0	7.9	17.8	60.4
أخذ وقتا طويلا لانهاء بعض الاطعمة والمشروبات بسبب الحساسية في أسناني	6.9	11.9	2.0	5.9	10.9	31.7	30.7
كانت هناك اوقات وجدت فيها صعوبة في تناول الاليس كريم بسبب الحساسية في اسناني.	3.0	5.0	2.0	5.0	5.9	23.8	55.4
لا بد لي من تغيير طريقة أكل و شرب بعض بسبب الحساسية في أسناني المأكولات	5.0	14.0	3.0	9.0	12.0	21.0	36.0
بسبب الحساسية في أسناني اتعامل بحذر مع الهواء البارد	5.9	15.8	2.0	7.9	6.9	18.8	42.6
عند تناول بعض الاطعمة يجب ان اتأكد انها لا بسبب الحساسية في أسناني ,تلمس اسنان معينة	4.0	12.9	4.0	5.9	10.9	25.7	36.6
بسبب الحساسية في اسناني انا استغرق وقتا اطول من غيري لانهاء طعامي و شرابي	7.9	34.7	1.0	5.9	14.9	18.8	16.8
تؤثر الحساسية في اسناني على نوعية الطعام الذي اتناوله عند الخروج مع اخرين.	3.0	19.8	2.0	9.9	7.9	27.7	29.7
اجد صعوبة في زيارة طبيب الاسنان لاني اعلم انها ستكون مؤلمة نتيجة حساسية في اسناني .	6.9	29.7	1.0	5.0	11.9	23.8	21.8
تناول او شرب اي شي يسبب حساسية أسناني يشعرنى بالتوتر	0	13.9	2.0	3.0	8.9	36.6	35.6
الحساسية في اسناني مزعجة	0	9.9	2.0	3.0	12.9	31.7	40.6
الحساسية في اسناني لا تحتل	0	28.7	2.0	10.9	11.9	18.8	27.7
وجود الحساسية في اسناني يجعلني اشعر باتني اكبر سنا	0	33.0	7.0	7.0	7.0	27.0	19.0
وجود الحساسية في اسناني يجعلني اشعر باتني اسناني تافة او مصابة	1.0	18.8	4.0	6.9	8.9	34.7	25.7
وجود الحساسية في اسناني يجعلني اشعر ان صحتي غير جيدة	2.0	24.8	3.0	5.0	13.9	24.8	26.7

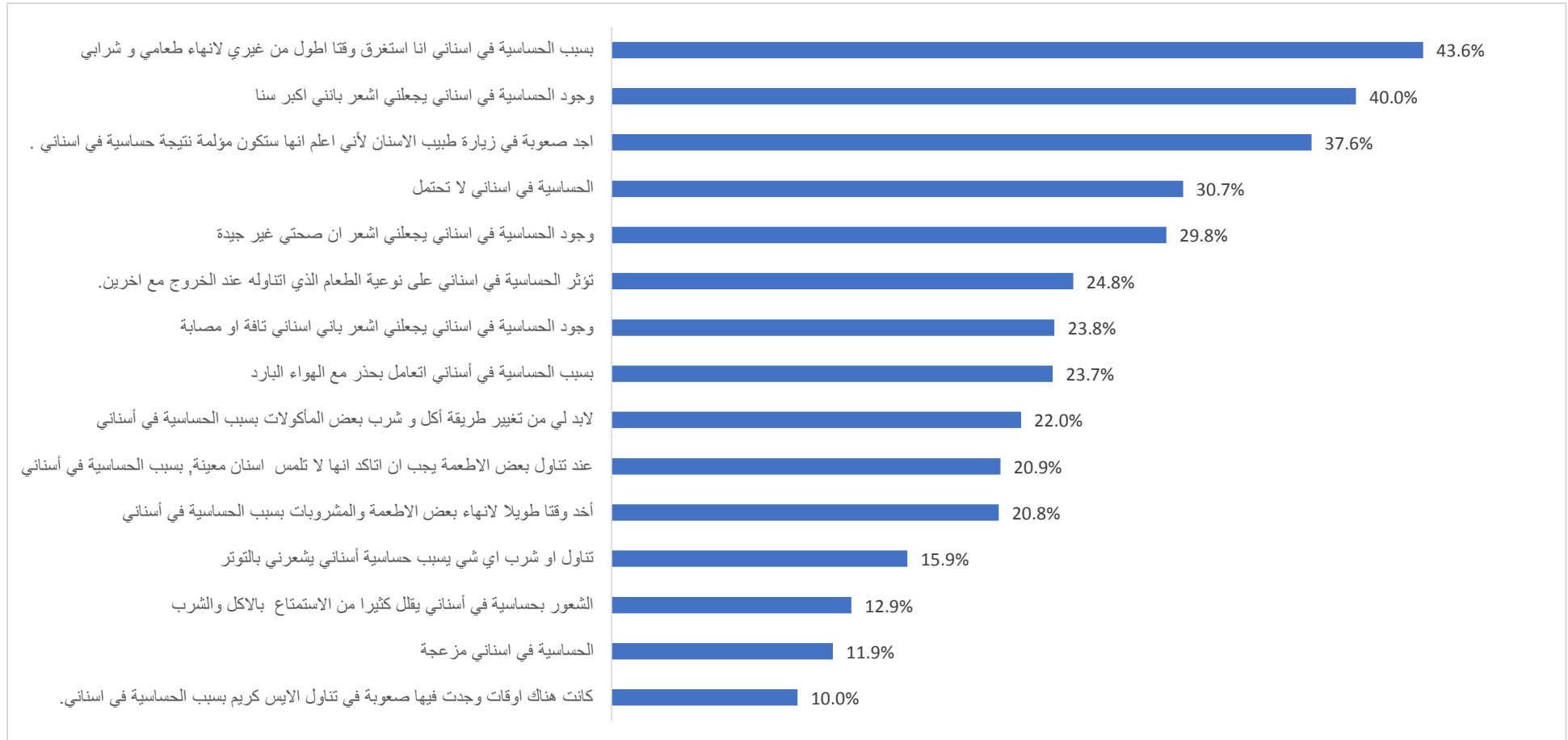


Figure 5-7: The impact of DH on OHRQoL

Chapter 6
DISCUSSION

Dentin hypersensitivity (DH) is one of the most common complaints from patients in dental clinics. DH is characterised by a short, sharp pain that arises from exposed dentin in response to non-noxious stimuli, typically thermal, evaporative, tactile, osmotic or chemical, and that cannot be ascribed to any other form of dental defects or diseases (31). There are two common methods to determine the intensity of DH. One of them is through asking some questions from the patient and the other is through clinical examination. The prevalence distribution of DH in the first method is usually estimated higher than that of the second method (52). The primary aim of the present study was to assess the prevalence of DH among adult Libyan dental patients using clinical examination. The data showed that 31% of participants had DH. This figure is comparable to the finding of Chinese study that used clinical tests on patients attending general dental practice in which the prevalence of DH reached a peak in adults of 34.1% (53).

Although DH is a frequent condition, epidemiological studies of the prevalence of DH have produced conflicting data ranging between 1.34% and 98%. This wide variation of prevalence may be related to heterogeneity of assessment methods, ranging from questionnaires to clinical detection. In addition, most studies of DH have examined highly selected populations, such as patients at periodontal offices, students, or hospitalized patients (54). Several studies indicate that even though high percentages of a population may report

having sensitive teeth, a much smaller proportion actually has DH diagnosed on the basis of defined clinical diagnostic criteria (55) . For example, a study of adults aged 18-35, recruited across 7 European countries, was conducted through the use of a self-administered questionnaire and clinical evaluation in response to a cold air stimulus found that 42% of participants diagnosed with DH (17). On contrary, a UK study of patients with ages ranging from 15 to 79 years who were assessed by general dental practitioners, prevalence of DH was found to be far lower at 3.8% (56). The UK study did not use a questionnaire and relied upon a verbal confirmation of sensitivity by the patient, with only those who indicated they had sensitive teeth receiving a clinical assessment in which sensitivity was confirmed following a cold air blast stimulus. The differences in prevalence rates between these 2 studies may reflect differences in the ages of the participants recruited, and the reliance of the latter study on potential participants confirming they had sensitivity before a clinical exam was undertaken. However, It is well accepted that the incidence of true DH in most general populations ranges from 10% to 30% (55).

In the present study, patients with DH were more likely to be those having periodontal problems. This is an unsurprising finding because Diagnosis of the symptoms of DH are predominantly found among patients with greater levels of gingival recession (29). The decrease in levels of DH found in older patients is reflected by a reduction in the permeability of dentine found in older

teeth. The hydraulic conductance of dentine from a group of patients between 45-69 years of age was found to be 80% less than dentine from those in a 20-28 years age bracket, which was thought to be as a result of increased intratubular crystals found in the aged dentine (57). However, it is well accepted that not all exposed dentine is sensitive and that DH is a multifactorial process that requires both lesion initiation and localization.

Although plaque accumulation on root surfaces may lead to demineralization of tooth structures, , some clinical studies have shown more gingival recession with improper or aggressive oral hygiene practices (58). The most brushed teeth and, therefore, the ones with the lowest plaque scores exhibited the most gingival recession and the most DH, despite having no plaque present. This may explain the present study finding that brushing with hard tooth brush is associated with more DH.

On contrary to several prevalence studies of DH where females are more affected than males participating(56, 59, 60), the present study showed no statistically significant difference between both sexes. Several scholars attributed gender differences in DH to an overrepresentation of females in study data (61). However, others suggested there are several possible reasons for the apparent higher prevalence of DH in females such as differences in the habit of toothbrushing which is correlated with exposure of dentine and is likely more a cause of gingival recession. The oral hygiene of females is acknowledged to be

better than that of males from a young age and the brushing style has been found to be more intensive(62). The situation could be further exacerbated by females consuming more fruit containing natural acids leading to increased levels of erosion(63). This mixture of abrasion and erosion creates an optimal scenario to increase the etiological risk factors for DH.

In terms of intraoral distribution, DH occurs most frequently on the buccal cervical zones of permanent teeth. In general, maxillary teeth seem to be more affected than mandibular teeth but, again, this difference often fails to reach statistical significance. The teeth with the most common occurrence are premolars and canines. Teeth with lower plaque scores are associated with DH, suggesting a connection between regular (possibly overzealous) toothbrushing and the onset of sensitivity. The most common stimuli that cause DH are, in order, cold drinks, hot drinks, toothbrushing, and sour substances (16, 64).

In the present study DH appeared to have little impact on the quality of life of patients. This can be ascribed to the subjective nature of pain. The experience of a sensory event is highly subjective, can vary substantially between individuals, and is related to individual tolerance of pain as well as to physical and emotional factors (65). It is known that although many individuals do not seek treatment to desensitize their teeth because they do not perceive DH to be a severe oral health problem, a substantial number of people experience

discomfort to the extent that it interferes with their eating, drinking, oral hygiene habits, and sometimes even breathing (66) .

The present study was conducted in dental patients which has several limitations which should be discussed here. First, the study used a convenience sample of dental patients who sought dental care. This limits the generalisability of the results to the general population. Therefore, future studies are required to provide data on the actual prevalence and distribution of DH in the Libyan Population. Second, dental clinical data may result in over estimation of DH or over-presentation of subgroups in the study sample which increase the risk of false positive findings. Previous studies have shown that when patients undergoing periodontal treatment are tested for DH, prevalence rises to a maximum of 98% (36). Finally, the study used cross-sectional design which can not provide information on the causal relationship.

The strength of this study, however, include using clinical diagnosis rather relying simply on the questionnaires which have been widely used and has been criticised for the lack of universal objective validation before being used as a scale of sample, no clear inclusion and exclusion criteria , and do not correlate the condition with its aetiological and predisposing factors, which can lead to an inaccurate relative conclusion (67). However, there are some questions that were not answered by the current study. For example, it remains unclear how Libyan dentist's manage DH and whether they were prepared to

handle such conditions. Little is known about the prevalence of periodontal diseases and erosion among Libyan population which are directly related to the occurrence of DH.

Chapter 7

CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions

In Libyan dental practice, DH is a commonly presenting condition. It may disturb people during eating, drinking, and oral hygiene habits. The aetiology of DH, which is directly connected with dentine exposure, due to, mainly, cold, stimuli as well as periodontal diseases as a key predisposing factor that may play an important role in initiating this condition.

7.2 Recommendations

- Oral health instruction to encourage behaviours that lead to the prevention of erosive and abrasive tooth wear and gingival recession should be routinely provided to all dental patients.
- Patients at risk of DH should be identified and their consumption of acidic food or beverages should be regulated. Tooth brushing techniques such as selection of soft bristle brush and non-abrasive toothpaste, and using vertical sweeping motion that minimize injury to dental soft and hard tissues should be emphasized.
- Future research is needed to assess the prevalence of DH among Libyan general population
- Dental education program should place more emphasis of DH as a common condition in Libyan dental practice.

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APPENDICES

Serial No:

age:

gender:

Educational level	
Marital status	
Work/work place	
Address	
Number of family members without father and mother.	

Oral health related habits and behaviours

1. How often do you brush your teeth?
 - a. Twice or more per day
 - b. Once a day
 - c. Sometimes per week
 - d. Occasionally
 - e. NO
2. How often do you use interdental aids(floss, tooth picks)
 - a. Twice or more
 - b. Once a day
 - c. Sometimes per week
 - d. Occasionally
 - e. NO
3. How often do you use mouth rinse
 - a. Twice or more
 - b. Once a day
 - c. Sometimes per week
 - d. Occasionally
 - e. NO
4. Do you use
 - a. Electric tooth brush
 - b. Manual tooth brush
 - c. Both

5. Do you use
 - a. hard brush
 - b. medium brush
 - c. soft
6. Do you use sewak
 - a. Yes
 - b. No

7. Do you use desensitizing toothpaste
 - a. Yes
 - b. No

8. How often do you drink fizzy drinks
 - a. 4 times or more per day
 - b. 3 times per day
 - c. Twice a day
 - d. Once a day
 - e. Some times per week
 - f. Occasionally
 - g. NO
9. How often do you drink coffee and tea per day
 - a. 4 times or more per day
 - b. 3 times per day
 - c. Twice a day
 - d. Once a day
 - e. Some times per week
 - f. Occasionally
 - g. NO
10. How often do you eat ice cream
 - a. 4 times or more per day
 - b. 3 times per day
 - c. Twice a day
 - d. Once a day
 - e. Some times per week
 - f. Occasionally
 - g. NO

11. How often do you eat hard food
 - a. 4 times or more per day
 - b. 3 times per day
 - c. Twice a day

- d. Once a day
- e. Some times per week
- f. Occasionally
- g. NO

12. How often do you eat citrus food

- a. 4 times or more per day
- b. 3 times per day
- c. Twice a day
- d. Once a day
- e. Some times per week
- f. Occasionally
- g. NO

13. Are you cigarettes smoker

- a. Yes
 - b. No
 - c. Ex /how much long time of cessation
- If yes, how many cigarettes per day?.....

For how many years,

14. Do you smoke shisha

- a. Yes
 - b. No
- If yes, how many times per day?.....

15. Do you take any medication or have any chronic illness?

- a. Yes
 - b. No
- If yes, Please specify?.....

16. Do you have any of the following conditions

- a. Vomiting
- b. Gastritis
- c. Pregnancy
- d. Diabetes
- e. GERD
- f. Eating disorders

17. How often do you visit the dentist

- a. Regularly for check up
- b. When I have problem

18. When was the last dental visit and its reason?.....

19. Chief complaint:

- a. DH
- b. Check up
- c. Others, specify

.....

Schiff Cold Air Sensitivity Scale : (0,1,2,3)

If have DH:

History of DH-:

Why did not seek treatment if DH was not the cc:

Time of start DH:

Nature of pain:

Duration of pain:

Intensity of the pain : low 1-2-3-4-5 very severe

Aggravating factors :

Relieving factors :

على حسب ما شعرت به خلال الشهر الماضي , الى اي مدي توافق او لا توافق على العبارات التالية
نرجو اختيار اجابة و احدة لكل عبارة و وضع دائرة على اختيارك

7 غير موافق بشدة	6 غير موافق	5 غير موافق قليلا	4 لا اوافق ولا اعترض	3 اتفق قليلا	2 موافق	1 موافق بشدة	
							1. الشعور بحساسية في أسناني يقلل كثيرا من الاستمتاع بالاكل والشرب
							2. أخذ وقتا طويلا لانهاء بعض الاطعمة والمشروبات بسبب الحساسية في أسناني
							3. كانت هناك اوقات وجدت فيها صعوبة في تناول الاليس كريم بسبب الحساسية في اسناني.
							4. لا بد لي من تغيير طريقة أكل و شرب بعض المأكولات بسبب الحساسية في أسناني
							5. بسبب الحساسية في أسناني اتعامل بحذر مع الهواء البارد
							6. عند تناول بعض الاطعمة يجب ان اتأكد انها لا تلمس اسنان معينة ,بسبب الحساسية في أسناني
							7. بسبب الحساسية في اسناني انا استغرق وقتا اطول من غيري لانهاء طعامي و شرابي
							8. تؤثر الحساسية في اسناني على نوعية الطعام الذي اتناوله عند الخروج مع الآخرين.
							9. اجد صعوبة في زيارة طبيب الاسنان لأنني اعلم انها ستكون مؤلمة نتيجة حساسية في اسناني .
							10. تناول او شرب اي شي يسبب حساسية أسناني يشعرنني بالتوتر
							11. الحساسية في اسناني مزعجة
							12. الحساسية في اسناني لا تحتمل
							13. وجود الحساسية في اسناني يجعلني اشعر بانني اكبر سنا
							14. وجود الحساسية في اسناني يجعلني اشعر بانني اسناني نافة او مصابة
							15. وجود الحساسية في اسناني يجعلني اشعر ان صحتي غير جيدة

الوظيفة
المستوى التعليمي

الجنس

العمر

الحالة الاجتماعية

- كيف تُقيم صحة فمك و اسنانك:

1. ممتازة () - 2 جيدة جدا () - 3 جيدة () - 4 عادية () 5-سيئة () 6 - سيئة جدا ()

حساسية الاسنان و تأثيرها على جودة الحياة لدى عينة من الليبين المترددين على عيادات الاسنان في مدينة بنغازي

قدمت من قبل :

نجاه مفتاح رحيل

تحت اشراف :

الدكتور. ارحيم العوامي

المخلص

الخلفية:

تعتبر الابحاث التي تهتم بدراسة حساسية الأسنان في العالم العربي نادرة حيث كشف البحث في محركات البحث عن بعض الدراسات التي تقيم انتشارها فكان الهدف من هذه الدراسة هو تقييم انتشار حساسية الاسنان بين الليبيين البالغين وتقييم آثارها على جودة ممارسة الحياة.

الطرق:

تم إجراء مسح مقطعي باستخدام الاستبيان والفحص السريري. قام الفاحصون الذين تم تدريبهم بتقييم وجود حساسية الاسنان بين مرضى الأسنان الليبين البالغين الذين يحضرون إلى العيادات الخارجية في مستشفى الأسنان التخصصي في بنغازي. أكمل المشاركون استبياناً ورقياً يغطي تاريخ الأسنان والشكوى الرئيسية والأعراض والألم المرتبط بحساسية الاسنان كما تم تحليل هذه البيانات باستخدام برنامج SPSS 25. أجريت جميع الاختبارات الإحصائية بقيمة p أقل من 0.05.

النتائج:

تضمنت الدراسة 397 عينة كان معدل انتشار حساسية الاسنان حوالي 31 % . إلا أن أغلب الحالات (80 ، 20.2%). عانى غالبية مرضى حساسية الاسنان من مشاكل اللثة (84%) ، تليها آلام الأسنان (19%) والفحص الدوري (11%). كان العامل الأكثر شيوعاً لتخفيف الالم هو "إزالة السبب" (13.9%) بينما كان العامل الأكثر مفاومة للألم هو المشروبات الباردة (21.4%). لوحظت زيادة نسبة الاصابة بحساسية الاسنان بين مستخدمي الفرشاة ذات الالياف الصلبة وأولئك الذين يستخدمون معجون أسنان مزيل للتحسس ($p \leq 0.05$).

الاستنتاجات:

في عيادة الأسنان اللبية ، تعتبر حساسية الاسنان حالة شائعة. قد تزجج الناس أثناء تناول الطعام والشراب وممارسة عادات نظافة الفم . تعتبر المسببات المرضية لحساسية الاسنان ، والتي ترتبط ارتباطاً مباشراً بالتعري لعاج الأسنان ، وهذا ما يعزى اليه الاستجابة للبرد والمحفزات وكذلك أمراض اللثة تعد عامل مهم و رئيسي في بدء هذه الحالة.



حساسية الاسنان و تأثيرها على جودة الحياة لدى عينة من الليبيين المترددين على عيادات الاسنان في مدينة بنغازي

قدمت من قبل :

نجاه مفتاح رحيل

تحت اشراف :

الدكتور ارحيم العوامي

قدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الاجازة العالية في تخصص

طب الفم

جامعة بنغازي

كلية طب و جراحة الفم و الاسنان

مارس 2022