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Original article

Evaluating the Correlation Between Stress or Phobia Due to Dental Procedure and Level of Saliva Secretion

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Abstract

Aim: This study focuses on evaluating the correlation between stress or phobia due to dental procedure and level of saliva secretion among the patients coming for dental treatment.

Materials and Methods: 200 medically healthy patients who required local anaesthesia for dental procedures were included. Sample collection was done at three different stages of treatment. In stage1, samples were collected after the patient had just entered the clinic and were discussing his problem sitting in normal chair in front of the Dentist. After the patients were seated in dental chair, before administering anaesthesia, samples were collected in stage 2 and in stage 3, immediately after administering local anaesthesia. One single spit of patient was collected at every stage in sterile container and measured with calibrated pipette.

Results: As documented in many studies the patient undergoing dental treatment experiences maximum stress before getting the local anaesthesia.

Our study revealed that in stage 2 when patient was about to undergo Local anaesthesia, saliva secretion was at minimum level averaging at 0.2 ml (ranging from 0 to 0.4). Saliva secretion was maximum in stage 1, when the patient was comfortably sitting in normal chair discussing their dental issues.

In stage 3 the saliva secretion slightly improved compared to stage 2 as after the anaesthesia the anxiety level of the patient started to diminish.

Conclusion: This study suggests that there is clinical correlation between stress levels and the amount of saliva secretion. Excessive stress can even lead to xerostomia as experienced by some patients.

Keywords: ***dental procedure, phobia, stress, saliva secretion.***

Introduction

Phobia is persistent, unrealistic, and intense fear of a specific stimulus, leading to complete avoidance of the perceived danger. Overwhelming and irrational fear of dentistry associated with devastating feelings of hypertension, terror, trepidation, and unease is termed “odontophobia”, and has been diagnosed under specific phobias according to the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV and the International Statistical Classification of Diseases and Related Health Problems (ICD) [1].

Saliva plays an important role in maintaining oral health, helping in maintaining the health of soft and hard tissues. Unstimulated salivary flow rate is defined as the volume of saliva secreted by major and minor salivary glands in a minute without any stimulation. The normal range of unstimulated and stimulated salivary flow rates are 0.3–0.5 and 0.5-0.7 mL/min, respectively [2]. When saliva flow is reduced, oral health problems such as dental caries and oral infections develop. The importance of saliva to the oral health becomes evident in individuals with a reduced salivary flow, particularly in the dry mouth syndrome or xerostomia [3]. The prevalence of xerostomia in the general population is high: 13-26% for men and 20-46% for women [4].

On the initial visit to the dentist, the patient can reveal the presence of anxiety, fear, stress or phobia. Phobia or stress among Paediatric age group is mostly general in nature and it is logical. In adults many factors including literacy level, awareness regarding dental hygiene, general anxiety, listening to some bad experiences of friends or colleagues in form of exaggerated stories play major role in development of phobia towards dental procedures. Phobia or stress of dental procedures especially local anaesthesia inside the oral cavity is commonly observed problem faced by dental practitioners. Many studies have documented that higher stress levels have direct impact on saliva secretions.

Higher stress levels have also shown to produce xerostomia. This study focuses on finding the correlation between the amount of saliva secretion at different levels of stress in various phases of Dental Treatment through clinically designed study.

Materials and Methods

Ethical approval

The study was registered with the Department of Public Health, Ministry of Health, Hafar al Batin. Ethical Approval of Ministry of Health's Ethics Committee was taken before starting the study. Informed written consent of the patients who were willing to participate in the study was taken.

Method

The study was designed to evaluate the correlation between stress or phobia due to dental procedure and level of saliva secretion. It involved 200 patients reported to the Department of Public Health, Ministry of Health, Hafar al Batin.

Sampling criteria

Inclusion Criteria were the subjects, in need of some dental treatment or routine dental examination, healthy subjects with no known underlying diseases, subjects between ages 20 and 60 years, non-smokers and non-alcoholics, and included females should be non-pregnant.

Exclusion Criteria were subjects who had a previous history of smoking, subjects who did not maintain normal sleep pattern, subjects who had a history of taking androgens, corticosteroids or oestrogen, and subjects who were not willing to participate in the study, subjects who have been on any previous long-term medication.

The study was divided into three stages, were the salivary samples were collected at three different stages of treatment.

Stage 1: When the patient had just entered and was discussing his dental problems while sitting on normal chair.

Stage 2: When the patient was sitting in the dental chair and was about to receive local anaesthesia injection.

Stage 3: Immediately after the patient received local anaesthesia.

The subject is made to sit quietly with the head bent down and the mouth open to allow the saliva to drip passively from the lower lip into the sterile container. One single spit of patient was collected at all the three stages in sterile container and measured with calibrated pipette.

Statistical analysis

Data was entered in Microsoft Excel spread sheet and analysed using SPSS (Statistical Package for the Social Sciences Software (version 21.0)). For test, a P-value of <0.05 was considered as statistically significant. ANOVA was used to estimate the variation in salivary flow levels across the three time periods in each of the stage groups. Multiple Comparison of salivary flow among three different stages i.e between stage 1&2, stage3&2, stage 3&1 was done using the j factor.

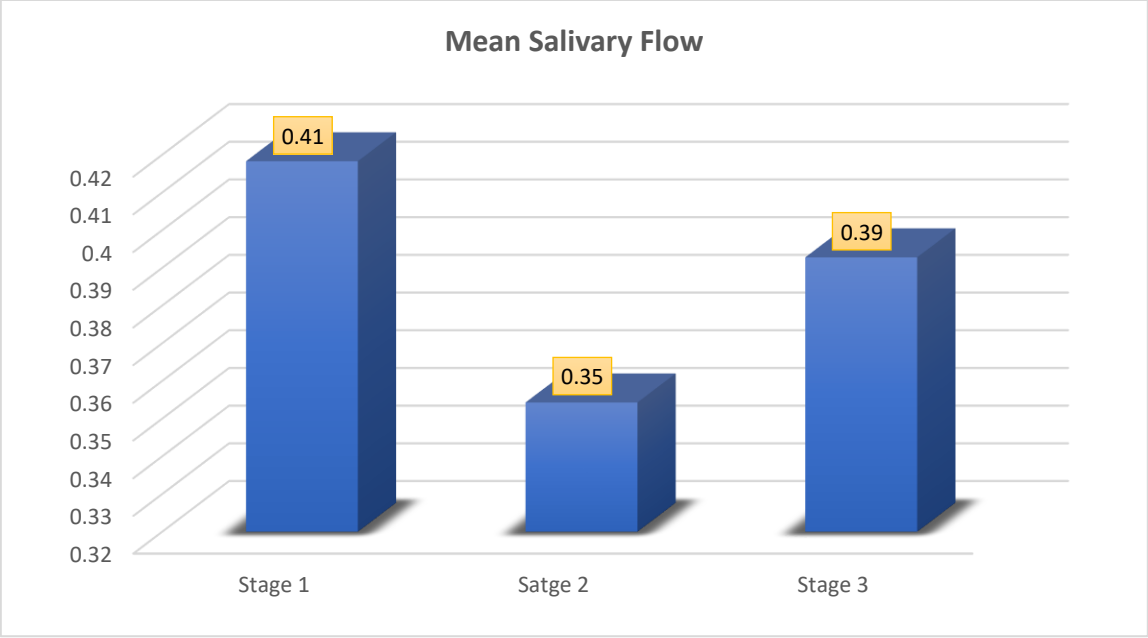
Results

The salivary samples of a total of 200 patients were collected in three different stages and were accessed to estimate the salivary flow in all the three different stages.

In stage 1 the mean salivary flow was about 0.41ml with a standard deviation of 1.02. In stage 2 the mean average salivary flow is about 0.35ml with a standard deviation of 0.26. Stage 3 showed the mean average salivary flow of about 0.39ml with the standard deviation of 0.51 suggesting that the average salivary flow is less in stage 2 as shown in Table 1 and graph 1.

Table 1

Salivary Flow	Mean	Std. Deviation	Lower Bound	Upper Bound
Stage 1	0.41	1.02	0.27	0.8612
Stage 2	0.35	0.26	0.31	0.3912
Stage 3	0.39	0.51	0.32	0.4647



Graph 1

As documented in many studies the patient undergoing dental treatment experiences maximum stress before getting the local anaesthesia.

Our study revealed that in stage 2 when patient was about to undergo Local anaesthesia, saliva secretion was at minimum level with a mean difference of about 0.25 ml in comparison with stage 1 i.e. when the patient were comfortably sitting in normal chair discussing their dental issues which is clinically significant with a p value of 0.021. (**Table and graph 2**)

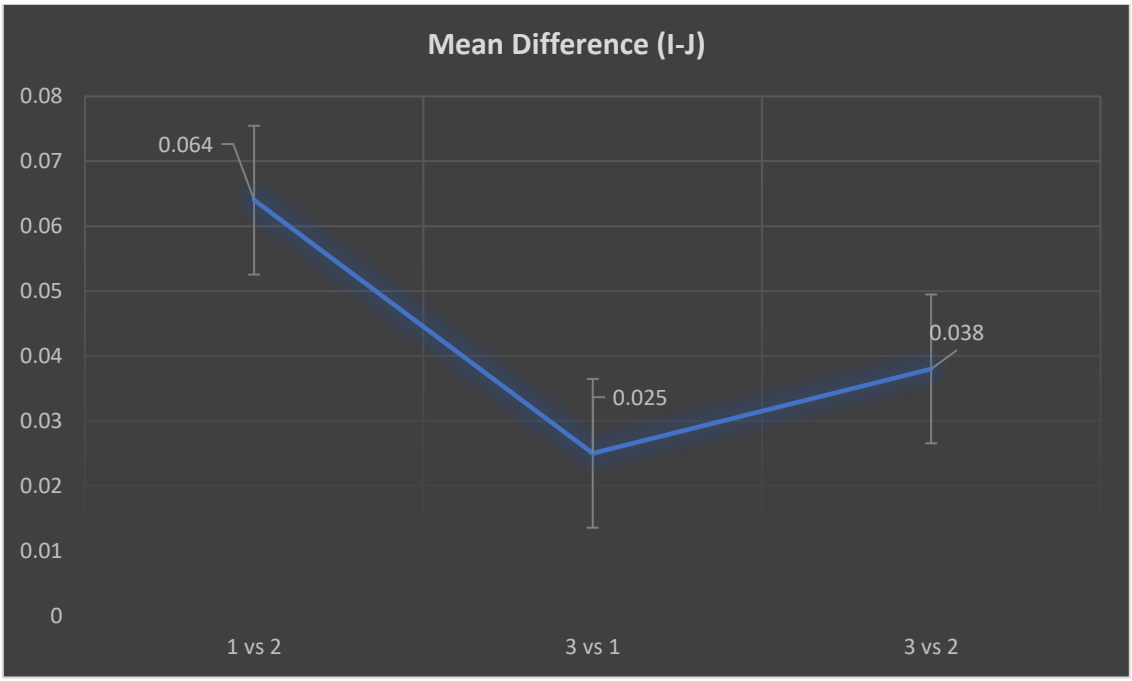
The salivary flow in comparison with stage 3 and stage 1 is not clinically significant with a p value more than 0.05 level which is 0.441. (**Table and graph 2**)

In comparison with stage 2 and stage 3 the saliva secretion slightly improved in stage 3, as after the anaesthesia the anxiety level of the patient started to reduce which is clinically significant with a p value of 0.01.(Table and graph 2)

Table 2

(J) factor1	Mean Difference (I-J)	Std. Error	P –value
1 vs 2	0.064	0.025	***0.021***
3 vs 1	0.025	0.014	0.441
3 vs 2	0.038	0.023	***0.011***

Based on estimated marginal means
* The mean difference is significant at the .05 level.
B Adjustment for multiple comparisons: Bonferroni.



Graph 2

Discussion

Fear and pain are the factors producing stress. Dental treatment is often considered as anxiety producing and stressful. Stress is an integral part of our lives. Stress is a common cause of health problems, and your oral health is no exception. Dental anxiety and phobia result in avoidance of dental care. It is a frequently encountered problem in dental office [5].

Dental anxiety can arise due to multiple factors, such as previous negative or traumatic experience, especially in childhood (conditioning experiences), vicarious learning from anxious family members or peers, individual personality characteristics such as neuroticism and self-consciousness, lack of understanding, exposure to frightening portrayals of dentists in the media, the coping style of the person, perception of body image, and the vulnerable position of lying back in a dental chair [6]. Anxiety can also be provoked by sensory triggers such as sights of needles and air-turbine drills, sounds of drilling and screaming, the smell of eugenol and cut dentine, and also sensations of high-frequency vibrations in the dental setting.

The salivary flow rate influences the chemical environment, and it provides a cleaning effect for salivary clearance in the oral cavity. The salivary flow rate is used to aid in the diagnosis of oral and systemic diseases [7].

The "stress hormone," cortisol is a useful marker in stress research offering the opportunity to indicate accurately the physiological stress levels experienced by patients during the treatment procedures [8]. Even though salivary cortisol accounts for about 50–60% of the free cortisol in the plasma, several reports show that there is a high correlation between the two, and saliva, in fact, is an accurate determinant of cortisol levels [9].

Psychological processes that are independent of salivary secretion may be related to xerostomia, it is noteworthy that depression, by stimulation of anticholinergic mechanisms, can reduce salivary flow rate.

Significant change in the manner in which a local anaesthetic injection is administered, thereby alleviating anxiety in patients who fear injections or are needle phobic.

Miller et al. observed that the stress associated with extractions is greater than that associated with other dental treatments [10]. Also in accordance with the findings of Banks and Steer, stress associated with extractions usually persists into the postoperative period as well [11, 12].

Hugo et al. also found no relation between self-reported stress and salivary flow in a population aged 50 years and older. Even though they concluded that being a dementia caregiver, which was assumed to be a proxy for chronic stress, was a risk indicator for low stimulated salivary flow [13].

Some studies have indicated that different emotions can decrease or increase salivary flow [14]. In addition, psychological disorders, like depression and anxiety, may be associated with xerostomia [15]. Anxiety and fear can potentially influence saliva secretion through pathways in the amygdala, hypothalamus, and brainstem [16].

Borhan et al, in his study showed that stress and depression play a significant role in reducing the salivary flow rate and in

increasing the incidence of xerostomia [17]. Bergdahl and Bergdahl evaluated 1202 individuals in three groups and showed that unstimulated salivary flow rate under 0.1 mL/min and xerostomia are seen more frequently in patients with depression, anxiety and stress [18].

The present study was to estimate the salivary flow under stress at three different stages. It showed that the salivary flow was significantly less in stage 2 with a mean value of 0.35 and a mean difference (I-J) of 0.64 in comparison with stage 1&2 with a p value of 0.021 and with a mean difference (I-J) of 0.038 in comparison with stage 3& 2 value of with p 0.011 suggesting that the level of stress increases as the patient was about to take anaesthesia in comparison with stage 1 and stage 3.

Conclusion

This study suggests that there is clinical correlation between perceived stress levels caused by phobia of dental treatment and the amount of saliva secretion. Excessive stress can even lead to xerostomia as experienced by some patients. We suggest variation in saliva secretion can be taken as sign of increased stress levels of the patient during treatment. This is especially important while working inside oral cavity when facial expressions of the patient are not appreciable.

Ethics approval and consent to participate

This study was approved by the Minstry of Health Hafar Al Batin, Institutional Review Board. Registration Number with Hafar Al Batin IRB, KSA is (H-05-FT-083) (approval no: 1701066).

Data Availability

The datasets generated during the current study are available from the corresponding author on reasonable request

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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This research was not funded by any agency or institute.

Authors' contribution

We confirm that all authors have significantly contributed to this study, throughout the research until the final approval of the paper.

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