

A Three Way Method to Mitigate Dentinal Hypersensitivity- A Randomized Controlled Trial

Dr. Krishna Kripal, BSc,BDS,MDS

*Dr. Aiswarya Dileep, BDS, MDS

Dr. Senthil Rajan, BDS,MDS

Dr. Thaslim Fathima, BDS,MDS

Dr. Manjunath S.M,BDS,MDS

Abstract

➤ *Aims:*

A clinical trial which is randomized was carried out to examine the successfulness of three agents which reduces the Dentinal Hypersensitivity (DH).

➤ *Materials and Methods:*

A total of 90 vital teeth, was distributed separately into 3 groups in accordance with response to cold air blast and stimuli which is tactile : Group 1: treated with 10% Propolis varnish, Group 2: treated with Diode laser (970 nm), and Group 3: treated with combination of 10% propolis varnish and diode laser. Various measuring scales were used to assess patients response towards these 3 techniques. The baseline scores were obtained. The patients were evaluated at 30 min for immediate effect, 7th day for intermediate effect, 21st day for late effect and scores were recorded.

➤ *Results:*

Pain reduction was observed in all the 3 groups. The VAS, NRS, VDS scores were determined, and found that statistically significant reduction of Dentinal Hypersensitivity in Group 3 than Group 2 and Group 1.

➤ *Conclusion:*

10% propolis varnish is used along with diode laser was seen to be statistically significant difference in decreasing the dentinal hypersensitivity as compared to other groups.

Keywords:- Dentinal Hypersensitivity, 10% Propolis Varnish, Diode Laser.

I. INTRODUCTION

Hypersensitivity involving dentin is characterized by a pain which is sharp and of short duration due to exposed dentin, in response to stimuli which is external such as thermal, evaporative, tactile, osmotic or chemical forces.¹ The incidence of Dentinal hypersensitivity ranges from 10% to 30%.² Dentinal hypersensitivity was commonly seen in the age group of 20 and 50 years, and proportionately females are affected than males.³ Due to the reparative processes of the pulp, the Dentinal Hypersensitivity tends to reduce, especially seen in more advanced age groups.⁴

Many studies have explained the mechanism of dentinal hypersensitivity; the most accepted theory is hydrodynamic theory which was proposed by Brannstrom and Astron⁵, which suggested that rapid shifts of the fluids within the dentinal tubules following stimulus application, result in activation of sensory nerves in the inner dentin regions of the teeth.⁶

The commonly used agents for the management of Dentinal Hypersensitivity are working for a short-duration. So, the emergence of new desensitizing agents is required.⁷ The search for an integrated medicine with long standing effects has led to the consideration that propolis had positive effects on the reduction of dentin hypersensitivity in humans.⁸

Propolis meaning: pro = in front, polis= city and it is derived from Greek.⁹ Propolis is a bee product which is naturally seen. It is widely used in integrated medicine has to ability to reduce inflammation, against fungal infection, antiseptis and helps stop bacteria from reproducing.⁷ A few studies which is invitro have found that, propolis had a positive effect on reduction of dentin hypersensitivity⁹.

Diode laser can favor the action of desensitizing agent for an extended duration than when they are using individually. Most of the studies described the action of lasers which is synergistic also in association with other agents. Due to this reason if laser is used along with desensitizing agent which is conventional and the agent left over the surface of the tooth for 60 secs prior to laser irradiation.¹⁰ Recent studies report satisfactory results of treatment with laser irradiation. Application of Diode laser to the exposed dentin leads to the coagulation of proteins provoking melting of dentin tissue causing thermochemical ablation blocking the movement of fluid.¹¹ The Diode lasers gives an effect of analgesia related to reduced transmission of nerve and blocking of depolarization of C afferent fibres.¹²

Many studies reported significant improvements in pain and sensitivity when used alone or as an adjunct to conventional therapies. Combined use of various natural therapeutic agents such as propolis and laser has shown to reduce discomfort of DH.¹³ The treatment with diode laser gives immediate effects and has the action of long lasting due to its capacity for the stimulation of secondary dentin formation.¹⁴

Limited data estimating above three methods has promote the requirement for a clinical trial. Hence, this randomized controlled trial was carried out for the comparison and evaluate the effect of 10% propolis varnish, laser and their combined effects in the reducing DH.

II. MATERIALS AND METHODS

Study population: This study is a randomized controlled trial, carried out at Department of Periodontics in a Dental College ,Bangalore. This study was approved by the Ethical Committee of the Institution RRDC&H/260/2017-2018 and registered in Clinical Registry in India CTRI/2018/06/014395. The trial was a study which is single centered and was done in the Department of Periodontology. This study was carried out between April 2018 to June 2018. All the recruiters were explained about the protocol of this clinical trial and written consent was taken from all the recruiters prior to the study.

❖ Selection Criteria

➤ Inclusion Criteria

- Patients willing to undergo desensitizing treatment
- DH was evaluated by using Response based assessment
- DH of teeth to cold air and tactile stimulus using in which minimum response of > 3 in NRS (from 0-10, where 0 means low intensity pain 10 representing the high intensity pain and discomfort)
- The response of the patient was measured by using VAS is a line 10 cm in length, the extremes of the line representing the limits of pain, a patient might experience from an external stimulus.
- The subject response was assessed by using a verbal descriptive scale (VDS) from 0-10, where 0 means no pain, 10 representing worst pain

➤ Exclusion Criteria

- Subjects were not ready to participate in the study.
- Patient showed allergic to 10% propolis varnish.
- Current desensitizing therapy.
- Pregnancy or breast feeding.
- Medical conditions which are systemically involved.
- Underwent Periodontal flap surgery in the preceeding 6 months
- Teeth and its supporting structures of the teeth "with any pathology which is painful.

➤ Baseline Screening

A total of 90 teeth with dentinal hypersensitivity were selected and added into three groups. (Table 1) Dentinal hypersensitivity was measured by means of response-based assessment ie the timed air blast and stimulus-based assessment, the tactile stimuli. All subjects were asked to rate the discomfort following the application of air by a three-way syringe at a distance of 2 mm and should 90° to the tested surface for around 3 seconds and on probing with

a sharp dental explorer. The subject's response was quantified using as a measurement which was taken at baseline, according to VAS, Numerical Rating Scale (NRS), Verbal Descriptive Scale (VDS). Adjacent teeth was isolated using the cotton rolls or even with finger's of the opearator.

➤ Preperation of 10% Propolis Varnish

The 10% propolis varnish used in the study was prepared in the Skanda Life Sciences Private Limited Bangalore. 5000 milligrams of propolis tablets which is commercially available was dissolved in 50 millilitre of 97% alcohol and the extract obtained was used for preparation of varnish.

III. METHOD OF APPLICATION

- Complete ultrasonic scaling was done.
- Proper isolation using cotton rolls.
- Drying of the site using a cotton pellet
- GROUP 1 (30 teeth) - Application of Propolis varnish directly on the site where hypersensitivity was there by using a cotton pellet and applied in 2 strokes 60 sec each.
- GROUP 2 (30 teeth) - Application of diode laser (SIROLaser Xtend) with parameters 0.5W, continuous, non-contact mode, which is applied 2-3 millimeter away from surface of the teeth for about 60 seconds, each tooth received 2 times of laser irradiation of 1 minute each.
- GROUP 3 (30 teeth) - Application of propolis and laser at above parameters. 10% propolis varnish was applied on surface of the tooth for about 60 seconds prior to the irradiation of laser.

The patients were given instructions not to rinse, eat or drink for atleast half an hour after the treatment and to avoid using any other desensitizing agent in the course of the investigation.

Patients were then evaluated after 30 min of baseline screening for immediate effect, 7th day for intermediate effect and 21st day for late effects.



Fig 1:- Pre-Operative View



Fig 2:- Application of 10% Propolis Varnish

IV. STATISTICAL ANALYSIS

The following tests of statistics were used in the present study:

The software named Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 Released 2013. Armonk, NY: IBM Corp., was used to perform statistical analysis.

Descriptive Statistics: It included the expression of the NRS, VAS for pain, Verbal Descriptive scale and occlusion of dentinal tubules in terms of mean and Standard Deviation.

Inferential Statistics:

One-way ANOVA test followed by Tukey’s HSD post hoc Analysis was used for the comparison of the mean NRS, VAS for pain, Verbal Descriptive scale between 03 study groups at different time intervals. Repeated measures of ANOVA followed by Bonferroni’s post hoc Analysis was used to compare the mean NRS, VAS for pain, Verbal Descriptive scale between different time intervals.

V. RESULTS

In our study in all the groups showed significant reduction of Dentin Hypersensitivity. On comparison among the 3 groups the immediate reduction of Hypersensitivity was found in Group 3 followed by Group 2 and Group 1 respectively and significant long-term reduction was registered in Group 2. The VAS, NRS and VDS reduction values for each group was estimated and found to be statistically significant after 21 days in all the 3 groups. There was a difference in mean values which was statistically significant between 10% propolis varnish and Diode laser group at baseline ($p < 0.001$), at 30 min (< 0.001), 7th day (< 0.001), 21st day (0.17) for VAS and < 0.001 for NRS and VDS using same results were observed between G1 and G3, and G2 and G3. Figure-3 shows the comparison of mean values of study parameters between 03 groups at Baseline using one-way ANOVA test followed by Tukey’s HSD post hoc Analysis. Figure 4 shows the immediate reduction was observed in Group 1 and Group 3.

Figure-7 shows there was a decrease of Dentinal Hypersensitivity which was statistically significance in all the 3 Groups.

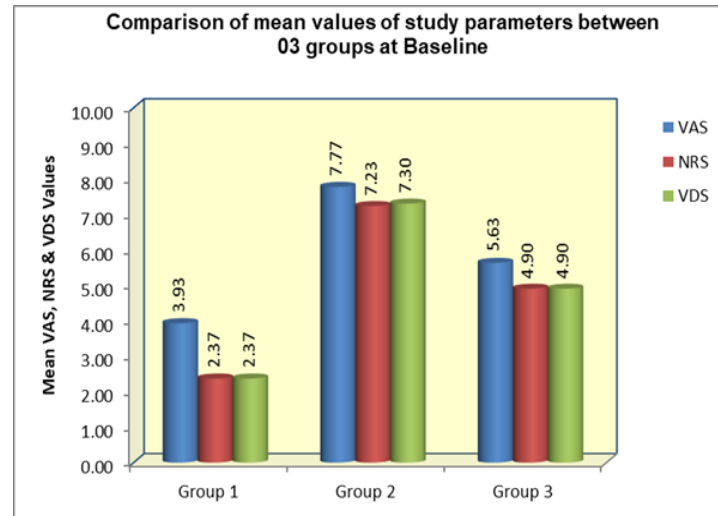


Fig 3

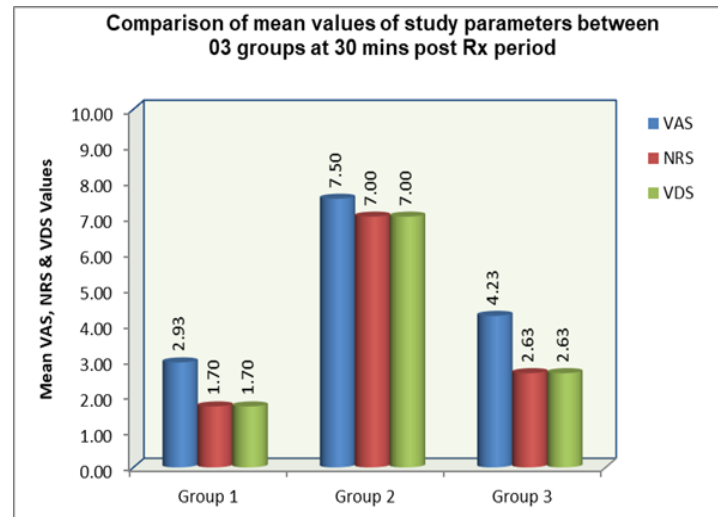


Fig 4

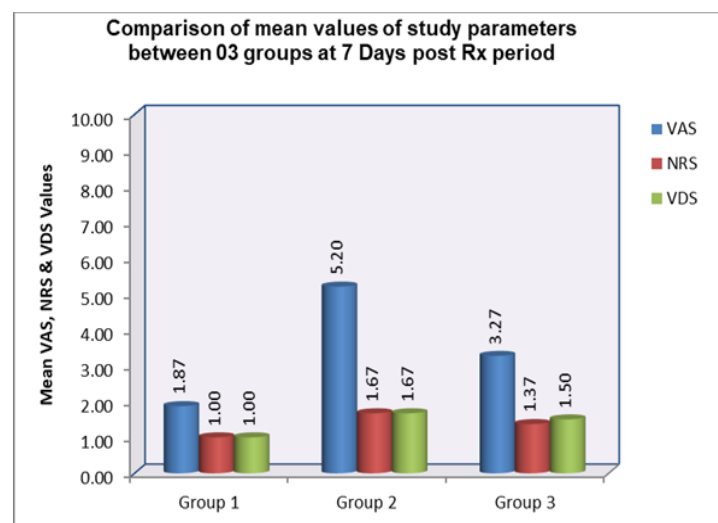


Fig 5

VI. DISCUSSION

The present study was a clinical trial that evaluated the effectiveness of 10% Propolis varnish as compared with laser and their combined effect in decreasing dentin hypersensitivity.

So many management strategies are there to treat DH. In this study, it was established that all of the desensitizing agents used were successful in the reduction of DH, as indicated by different scale scores, which shows the nature of hypersensitivity perception and the variability of responses over times.¹⁵

Ideally, the recall period in this trial should be more than three weeks; however, it was observed that the subjects might not be compliant after three weeks. As the aim of this trial was to check which desensitizing agents eliminates and gives rapid relief of the patients, so we decided to organize a three-week study.¹⁶

To determine the patient’s sensitivity levels in this trial the reaction to both the stimuli was interpret into data using various scales that are the suitable methods used to diagnose DH related pain levels.

To estimate DH related pain ,our study included more than one method for diagnosing Dentinal hypersensitivity as advocated by Holland et al.¹⁷

Their suggestion derived from the factor that various methods can evoke discrete DH related pain sensations. All dentinal hypersensitivity surface are examined by using an explorer as a tactile stimulus, which causes the dentinal fluids to move inside due to the compression of the dentin. Thus, receptors which causing the painful sensation are triggered.¹⁸

Air stimulus decreases the temperature on the dentin surface, causes a rapid outward movement of fluid from opened dentin tubules, which elicits pain.¹⁹

For these reasons, a standard dental explorer was used as a tactile stimulus and timed air blasts as an evaporative stimulus.

Most of the studies describe the activity of diode lasers in relation with these agents. This diode laser favors life span of the desensitizing agent for extended duration than when they can be used separate. Because of this reason, if diode laser is used along with other agents, the agent remains on the surface for 1 minute prior the irradiation.¹⁰

Mahmoud and colleagues. organised a study to check the outcome of propolis on hypersensitivity in-vivo. The study drawn a fact that propolis had a positive effect on the decreasing of dentin hypersensitivity. In the present clinical trial, it is concluded that there was a significant decrease in the severity of dentinal hypersensitivity treated with 10% propolis as well as with laser.²⁰

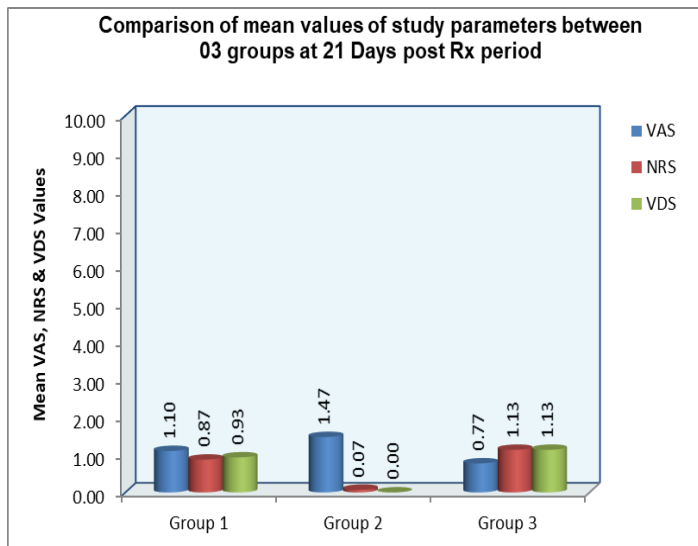


Fig 6

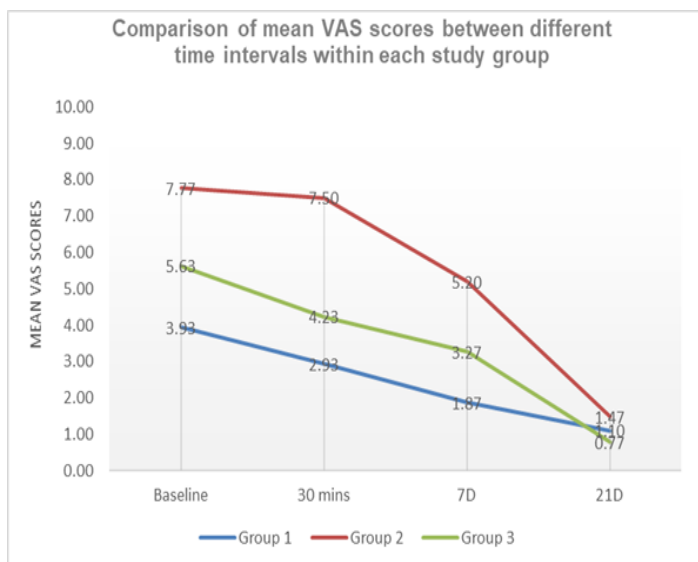


Fig 7

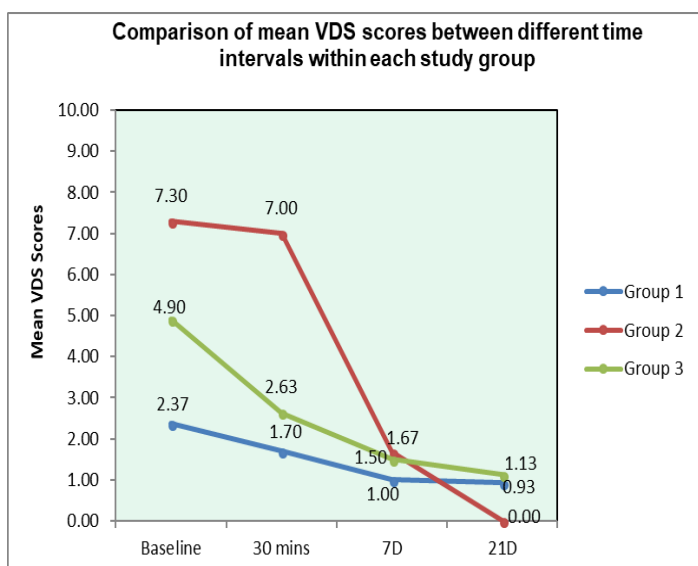


Fig 8

Tung et al., postulated that the materials CPP-ACP and propolis precipitate and obstruct the dentinal tubules and that they decrease dentinal permeability by 85% or more.²¹

In a study by Matsumoto, found an 85% decrease in DH teeth with diode laser;²² Aun et al. found that there is positive result in laser-treated in 98% of their subjects²³; Yamaguchi et al. assessed an effective improvement index of 60% in the group treated with laser compared to the 22.2% of the control non-lasered group.²⁴

In the clinical study, significant reduction in pain and discomfort were found in all 3 treated groups.

Small treated population and post-operative period of 3 weeks which was the limitations of this clinical trial, 10% propolis varnish is used as an adjunct to diode laser showed better results, since the DH related pain reduction in Group 3 and Group 2 were more than Group 1 values. In our clinical trial the better outcome were obtained by the combined use of 10% propolis varnish and laser.

This randomized controlled trials reports for the first time the combination of 10% Propolis varnish and the diode laser for the reduction in Hypersensitivity. The strength of this original research is to govern the productiveness of the desensitizing materials which is immediate for the reduction of Dentinal Hypersensitivity

VII. STUDY LIMITATIONS AND RECOMMENDATIONS

More Randomized clinical trials which include more number of subjects for checking the extended effects of dentinal hypersensitivity treatment with propolis are recommended.

VIII. CONCLUSION

Within the clinical methods and limitations of this study, the following conclusions can be obtained:

- 10% Propolis varnish is used along with diode laser shown significant reduction in Dentinal hypersensitivity.
- Combination of 10% propolis varnish and diode laser showed an immediate effect in reduction of dentin hypersensitivity and highest patient satisfaction, without any side effects.

ACKNOWLEDGEMENTS

We sincerely thank Skanda Life Sciences, Bangalore, India) for his immense support in the study. We also express our gratefulness to Dr.Santhosh, RRDCH.

- *Author Disclosure Statement*
No competing financial interests exist.

REFERENCES

- [1]. Bogdanov et al Propolis: composition, health, medicine: a review. Bee Product Science, 2017.
- [2]. Brannstrom M, Astrom A. The hydrodynamics of the dentin, its possible relationship to dentinal pain. Int Dent J. 1972; 22:219-27.
- [3]. Brannstrom M, Astrom A. A study on the mechanism of pain elicited from the dentin. JDR. 1964; 43:619-25.
- [4]. C. A. Aun, A. Brugnera-Júnior, and R. G. Villa. Raio laserHipersensibilidade dentinária, Revista da APCD 1989; 43: 65–68.
- [5]. Chauhan AS et al Effect of the clinical application of GLUMA Desensitizer vs Gallium Aluminium Arsenide Diode Laser in the treatment of Dentin Hypersensitivity: A Scanning Electron Microscopy Study Int J Prev Clin Dent Res 2017;4(4):279-283
- [6]. Dantas EM et al. Clinical efficacy of fluoride varnish and low-level laser radiation in treating dentin hypersensitivity. Brazilian dental journal. 2016 Feb;27(1):79-82.
- [7]. Geiger S, Matalon S, Blasbalg J. 'The clinical effect Amorphous calcium phosphate on root surface Hypersensitivity. J Oper Den. 2003:496–500.
- [8]. Holland GR et al. Guidelines for the design and conduct of clinical trials on dentine hypersensitivity. J Clin Periodontol. 1997; 24(11):808-813.
- [9]. Hsu PJ, Chen JH, Chuang FH, Roan RT. The combined occluding effects of fluoride-containing dentin desensitizer and Nd-Yag laser irradiation on human dentinal tubules: an in vitro study. The Kaohsiung journal of medical sciences. 2006 Jan 1;22(1):24-9.
- [10]. Isabel CCM Porto, Ana KM, Andrade, Marcos AJR Montes. Diagnosis and treatment of dentinal hypersensitivity. J Oral Sciences. 2009; 51:323-32.
- [11]. Krauser JT. Hypersensitive teeth, part II: treatment. J Prosthet Dent. 1986;56(3):307-311.
- [12]. KVV Prasad, R Sohoni, S Tikare, M Yalamalli, G Rajesh, SB Javali. Efficacy of two commercially available dentifrices in reducing dentinal hypersensitivity. Indian J Dent Res. 2010; 21:224-30.
- [13]. Launay. Y, Mordon.S, Cornil. A, Brunetaud.J. M. and Moschetto.Y. Thermal effects of lasers on dental tissues, Lasers in Surgery and Medicine 1987; 7:473–477.
- [14]. Lussi A, Schaffner M. Progression of and risk factors for dental erosion and wedge-shaped over a 6-year period. Caries Res. 2000; 34:182-7.
- [15]. Madhavan S, Habibullah MA, Varma DL, Shetty DR. Management of dentinal hypersensitivity: a review. International journal of scientific research. 2018 Feb 6;6(11).
- [16]. Mahmoud AS, Almas K, Dahlan AA. The effect of propolis on dentinal hypersensitivity and level of satisfaction among patients from a university hospital Riyadh, Saudi Arabia. Indian J Dent Res. 1999; 10(4):130-7.

- [17]. Matsumoto K. Ssydy on the Treatment of Hypersensitive Dentine by Ga Al As Laser Diodez. *J Jpn Conservative Dentistry*. 1985;28(2):766-71.
- [18]. M. Yamaguchi, M. Ito, T. Miwata, Horiba N, Matsumoto T and Nakamura H. Clinical study on the treatment of hypersensitive dentin by GaAlAs laser diode using the double blind test, *Aichi Gakuin Daigaku Shigakkaishi* 1990; 28: 703–707.
- [19]. Narmatha et al. An In-Vivo Comparative Study of the Efficacy of Propolis, Nano-Hydroxyapatite and Potassium Nitrate Containing Desensitizing Agents. *Research & Reviews: Journal of Dental Sciences*. 2014;2(2):113-8.
- [20]. Park YK, Koo MH, Ikegaki M, Cury JA, Rosalen PL. Effects of propolis on *Streptococcus mutans*, *Actinomyces naeslundii*, *Staphylococcus aureus*. *Rev Microbiol*. 1998; 29:143-8.
- [21]. Pashley et al. Mechanism of dentin hypersensitivity. *Dent Clin North Am*. 1990;34(3):449-473.
- [22]. Silvia Helena de Carvalho Sales-Peres, Flavia Negreiros de Carvahlo, Juliane Avansini Marsicano. Effect of propolis gel on the in vitro reduction of dentin permeability. *J Appl Oral Sci*. 2011; 19:318-23.
- [23]. Walter PA. Dentinal hypersensitivity: A review. *J Contemporary Dent Practice*. 2005; 6:1–10.
- [24]. Yoshizaki KT et al . Clinical features and factors associated with non-carious cervical lesions and dentin hypersensitivity. *Journal of oral rehabilitation*. 2017 Feb;44(2):112-8.