

# Honey as a Medium of Non-Surgical Periodontal Therapy

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## ABSTRACT

Gingivitis is an infection caused by plaque and calculus accumulation. Gingivitis if not treated progress to periodontitis, a more advanced form of gum disease. Periodontal disease was the world's 11th most frequent disease in 2016 according to the World Health Organization. Surgical as well non-surgical periodontal therapies are carried out for periodontal disease treatment.

Debridement of supra-gingival and sub-gingival calculus, along with instructions about oral health care methods are the basis of traditional non-surgical periodontal therapy (NTPS). Honey is beneficial to oral health, particularly in the cure of plaque formation, gingiva inflammation, periodontitis and odor control. Honey has antibacterial activity and is effective against both gram-positive as well as gram-negative bacteria. Honey's antibacterial and anti-inflammatory characteristics can promote the granulation tissue formation and enabling damaged cells to be regeneration.

**Materials And Method:** This review followed the guided framework from the approach of Arksey and O'Malley for the scoping review (2005). The methodology was chosen because it has a five-stage framework. Exclusion & inclusion criteria were made and 60 articles were selected. Articles were searched from the PubMed, Google Scholar and other search engines.

**Results:** Based on the data retrieved we concluded that honey can be used as a medium for non-surgical periodontal therapy. Honey have antibacterial and anti-inflammatory properties due high osmolarity, acidic nature and hydrogen peroxide as well non-peroxide components of honey and is used by many researcher for cure of periodontal disease but still there is not very strong evidence that locally given honey affects periodontal tissue healing. Despite this, all of the pockets had a good periodontal repair. Honey's efficacy in the treatment periodontal disease is still not well established and still questionable. To substantiate these findings from the literature, more research will be required.

## INTRODUCTION

Gingivitis is a gum infection caused by plaque and calculus accumulation. Gingivitis if not treated progress to periodontitis, a more advanced form of the disease characterized by alveolar bone loss and identified by increased depth of probing, attachment loss, and evidence of bone loss. Periodontal disease, on the other hand, is curable and even preventable (Kotwal, 2013). The oral micro flora is comprised of around 700 species including aerobic and anaerobic bacteria (Pasich et al., 2013, Harvey, 2017). The bacterial load needed to be eliminated through non-surgical and surgical periodontal therapy.

Non-surgical periodontal therapy is a "gold standard" technique to improve periodontal status, improving patient safety and reduced co-morbidities both promptly and over time (Khan et al., 2021). Previous literature has shown that certain modalities are known to be successful in treating periodontal disease such as honey. Honey stimulates epithelial development, improves angiogenesis, simplifies wound closure, and increases collagenesis, all of which help to speed wound healing (Seraglio et al., 2021). Otręba et al. reported that honey has a powerful antibacterial effect against bacteria that cause pharyngitis, periodontitis, gingivitis, caries, recurrent aphthous ulcers, supra and subgingival plaque (Otręba et al., 2021).

**Non-surgical periodontal therapy:** Debridement of supra and sub-gingival plaque and calculus, along with instructions about oral health care methods are the basis of traditional non-surgical periodontal therapy. These approaches are aimed at lowering bacterial loads and shifting microbial composition toward a more health-promoting flora (Ower, Kotwal, 2013).

NSPT was proven to be a successful treatment for reducing depth of pocket on probing and increasing level of clinical attachment of junctional epithelium. The treatment is regarded successful when the pocket depth is less than or equal to 5mm (Van der Weijden, Dekkers and Slot, 2019).

**History:** Scaling and root planning, followed by surgery aimed at having zero pocket depth, were the most common treatments until the 1980s. In 1980s, data was gathered demonstrating that the

root debridement and subgingival control of infection, rather than that periodontal pockets is present or not, is the most important determinant of successful periodontal therapy, and NSPT became a popular treatment (Kotwal, 2013).

**Options Available for Non-Surgical Periodontal Therapy (NSPT):** Non-surgical periodontal treatment comprises of Management of modifiable risk factors, biofilm removal from surfaces of tooth and periodontal pockets by a specialist, Periodontal periodic evaluations and supportive periodontal therapy (Ghuman, 2020). NSPT procedures are:

**Manual or ultrasonic instrumentation:** Manual instrumentation, as well as ultrasonic scalers or sonic scaling instruments, have been demonstrated to be very useful in minimising the risk of tooth loss, slowing the advancement of periodontal damage condition, reducing bleeding on probing, and improving gingival health. Hand scalers have been called the "gold standard" in periodontal therapy, although they take longer, require more skill, and are exhausting for both dentists and patients. Ultrasonic instrumentation, on the other hand, enhances patient compliance and reduces the time required for comprehensive debridement (Heitz-Mayfield and Lang, 2013, Bhansali, 2014).

**Laser therapy:** For the past few years, lasers have been supported for subgingival debridement, decrease of sub gingival bacterial loads, scaling, and root planing within the periodontal pocket (SRP). However, physicians disagree that it is useful in clinics in the treatment of periodontal diseases, and there is a paucity of clinical evidence to support its superiority to traditional mechanical therapy (Sgolastra et al., 2012, Sumra et al., 2018).

**Photodynamic therapy:** Photodynamic therapy (PDT) is a type of treatment that uses light. Antibacterial PDT is a method which is non-invasive that works by triggering an oxygen-dependent photochemical reaction when a photosensitizing substance attached to the target cell is activated by light (Sgolastra et al., 2013, Talebi et al., 2016).

**Adjunctive chemotherapeutic therapy:** Antibiotics and antiseptics, sub gingival pocket irrigation, and host modification

therapy are some of the methods used to treat periodontal disease (Bhansali, 2014).

### Honey

**Chemical Composition:** In the Holy Quran more than 1400 years ago honey was said be healing for mankind. **“There comes forth from their bellies, a drink of varying color wherein is healing for men. Verily, it is indeed a sign for people who think (Sura Al-Nahl, Aya 69)”**

Honey is characterized as a sugar solution that is supersaturated. 82.4 percent carbs, 38.5 percent fructose, 31% glucose, 12.9 percent other sugars, 17.1 percent water, 0.5 percent protein, minerals, amino acids, organic acids vitamins, phenols, and a variety of other minor chemicals make up natural honey. Honey also contains trace levels of beneficial compounds such as phenolic acid, flavonoid, and tocopherol. Moreover, honey contains ascorbic acid, proteins, carotenoids, and enzymes including glucose oxidase and catalase, which have positive health advantages (Pasupuleti et al., 2017). Carbohydrates, vitamins (vitamin B complex and anti-oxidant vitamin C, E, and A), enzymes (glucose oxidase and lysosomal enzyme), fatty acids, amino acids, essential fatty acids and hormones needed by body are all abundant in honey. It also contains a variety of important macromolecules and aliments required in trace amount including Ca, Fe, Mg, Zn, Na, F, Mn and K for proper function of body. Furthermore, honey contains two peptides: major royal jelly protein 1 (MRJP1) and defensin-1, they both have potent antibacterial properties (Khan et al., 2018, Martinello et al., 2021). Honey's antibacterial properties are attributed to hypotonicity, hydrogen peroxide, flavonoid, and methylglyoxal (Albaridi, 2019).

According to new research, honey has a high level of activity against the bacteria that cause carious lesions, periodontitis, pharyngitis, RAS ulcers, gingival inflammation and supra and subgingival plaque accumulation (Otręba et al., 2021).

**Clinical Significance of honey in dentistry:** Many oral disorders, such as periodontal disease, stomatitis, and halitosis, can be treated with honey. It's also used to prevent plaque formation, gingivitis, mouth ulcers. Honey's antibacterial and anti-inflammatory qualities can promote the formation of granulation tissue, allowing damaged cells to be repaired (Anyanechi and Saheeb, 2015).

Plaque removal properties of Honey has a broad antimicrobial range, effective against both positive and negative rods, yeast, fungus, positive and negative cocci. Several studies have found that chewing honey reduces the numbers of *Streptococcus mutans*, *Porphyromonas gingivalis* and *Lactobacillus acidophilus* (NAIR et al., 2017).

Stomatitis, or inflammation of the mouth's mucous membranes, can cause redness and swelling of the oral tissues, as well as prominent and painful ulcers. Honey is useful against stomatitis because it penetrates fast into the tissues. Halitosis is a bad breath condition caused by an oral health problem (Pasupuleti et al., 2017).

Honey also helps in Post extraction healing, Mouth ulcers, recurrent herpes labialis, lichenplanus, blister lesions of oral cavity (Münstedt, 2019), and to limit the side effect of radio therapy and Post radiotherapy mucositis (Nagi et al., 2018, K, F and J, 2019).

**Honeys as a NSPT:** Periodontitis is caused by *Porphyromonas gingivalis*, Gram-negative bacteria. Honey has an antibacterial effect on this anaerobic bacterium, which helps to avoid periodontal disease (Eick et al., 2014). Honey's anti-inflammatory and antioxidant characteristics, as well as its activation of leucocytes and encouragement of the formation of granulation tissue and epithelial cells, may help to treat periodontal disease by aiding in the repair of damage caused by pathogenic bacteria and free radicals so help in healing of periodontal tissue (NAIR et al., 2017). After using honey, Yadav et al. and Bansalet al. found a significant reduction in mean gingival scores and *S. mutans* colony count (Yadav et al., 2014, Bansal et al., 2015).

**Varieties of honey relation with use in periodontitis:** Different types of honey were used at differet times and the effect on

periodontitis were recorded using Tualang Honey, Manuka Honey, Coniferous Honey, Thyme Honey, Citrus Honey, Acacia Honey, Carob Honey, Eucalyptus Honey, Harmal Honey, Jujube Honey, Lavender Honey, Orange Honey, Reseda Honey, Rosemary Honey (Zainol et al., 2013, Campeau and Patel, 2014, Taib et al., 2018).

Manuka honey has antibacterial properties against a variety of oral pathogens. The methylglyoxal and phenols level of Manuka honey were shown to be connected to the Unique Manuka Factor (UMF). Various forms of Manuka honey have different effects and gram-negative bacteria are more resistant to Manuka honey than gram-positive bacteria, according to reports (Johnston et al., 2018). Eick et al., 2014 evulated the effect of a local produce German honey from a honey maker and Manuka honey from New Zealand and saw their effect of hydrogen peroxide as well as methylglyoxal on *Porphyromonas gingivalis*. Manuka honey, in particular, inhibits the growth of *P. gingivalis*, a significant periodontopathogen. The component methylglyoxal is responsible for this action on planktonic bacteria but not on biofilm. Biofilms containing *P. gingivalis* may be destroyed by honey. As a result, incorporating honey or its constituents into oral health-care products could aid in the prevention and treatment of periodontitis.

Natural honeys have antibacterial action in vitro against Gram-positive and Gram-negative bacteria, including multidrug-resistant strains. Combining the *Scaptotrigona bipunctata* (SB) and *Scaptotrigona postica* (SP) could lead to the development of novel broad-spectrum antimicrobials that could help prevent the spread of resistant bacterium strains (Nishio et al., 2016).

The ability of Tualang honey to kill specific microbes suggests that it could be utilized as an alternative therapy for a variety of medical ailments, including wound infections (Al-Kafaween et al., 2020). Tualang honey exhibits antibacterial activity against a number of periodontal infections, including *A. actinomycetemcomitans*, *P. gingivalis*, *S. gordonii*, and *Campylobacterspp* (Hbib et al., 2020). Periodontal pocket depth, clinical attachment level in all periodontal pockets improved significantly during NSPT with Tualang honey (Ibrahim et al., 2021). Xin et al., 2015 concluded that Tualang honey stimulates human Periodontal Ligament Fibroblast proliferation at low concentrations but inhibits it at high ones. In patients with persistent periodontitis, Tualang Honey could be used as an addition to scaling and root planing (Abidin, and Frontiers 2020, 2020).

## MATERIALS AND METHOD

This review followed the guided framework from the approach of Arksey and O'Malley for the scoping review (2005). The Arksey and O'Malley methodology was chosen because it has a five-stage framework: (1) defining the research topic; (2) identifying relevant studies; (3) study selection; (4) data charting; and (5) collecting, summarizing, and reporting the findings.

**Identification of Research Question:** This scoping review is guided by one question; Is honey used as a medium of non-surgical periodontal therapy?

**Identifying Relevant Studies:** The search terms “honey and periodontitis”, “honey and non-surgical periodontal therapy”, “Options Available For NSPT”, “Chemotherapeutic approaches in NSPT”, “Host modulation therapy” “Composition of honey” “Properties of honey” “Use of honey in periodontitis” “Clinical significance of honey in dentistry” and “Variety of honey used in periodontitis” were used in Google Scholar, Cochrane Library and PubMed.

### Study Selection

#### Inclusion criteria:

(1) Journal articles published between January 2011 to 2022 were included in this review. Articles describing “honey and periodontitis”, “honey as adjutant surgical periodontal therapy”, “Options Available For NSPT”, “Chemotherapeutic approaches in NSPT”, “laser therapy” “Composition of honey” “chemical properties of honey” “Use of honey in periodontitis” “Clinical

significance of honey in dentistry" and " different types of honey used in periodontitis" were included.

**Exclusion criteria:**

(2) Article or studies excluded on the following basis; peer-review journal, newspaper article, blogs should not be included, was not written in English, and are not relevant to honey used as a medium of non-surgical periodontal therapy.

**Charting the Data:** Data from these articles were compiled on an excel sheet using Microsoft® excel.

**Collating, Summarizing, and Reporting the Results:** Three researchers extracted articles according to themes included in this study: "honey use in periodontitis", "honey usage in non-surgical periodontal therapy (NTPS) plaque control", "Options Available For NSPT", "Chemotherapeutic approaches in NSPT ", "honey as antibacterial against different microorganisms" "Composition of honey" "Properties of honey" "clinical trials for NTPS" "Use of honey in periodontitis related problems" "Clinical significance of honey in dentistry" and " Variety of honey at different concentration and different forms used in periodontitis"(Figure 1).

**RESULTS**

26 (43.3%) articles included in the study were from year 2018-2022, 15 (25%) were from year 2014-2017, 19 articles (31.6%) from year 2011-2014 as shown in figure 2. 11 publications were from india, 5 from United States of America, 4 were from KSA, 4 from Iran , 6 from Malaysia and others as shown in figure 3. All the articles included studied twice and the data was extracted from it and sorted in potential themes. Figure 4 shows the method of study.

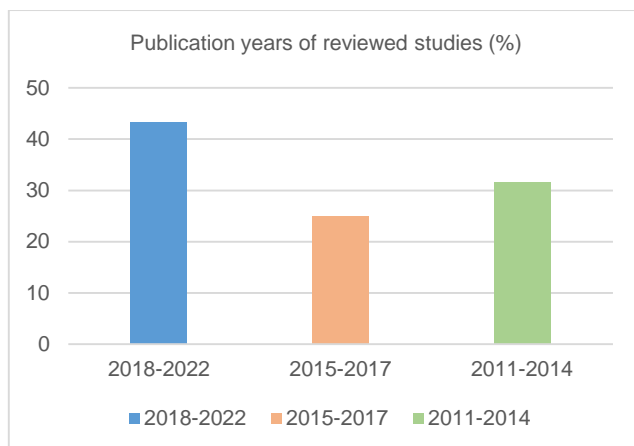


Figure1: Publication years of reviewed studies (%).

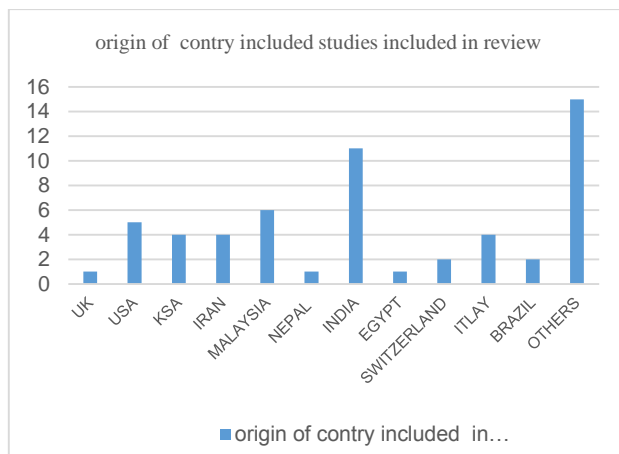


Figure 2: Origin of country of studies included in review.

Others countries include: France,Romania,Africa,Australia,China,Poland,Russia,Newzealand,Negeria,Croatia,Greece,Germany, Singapore

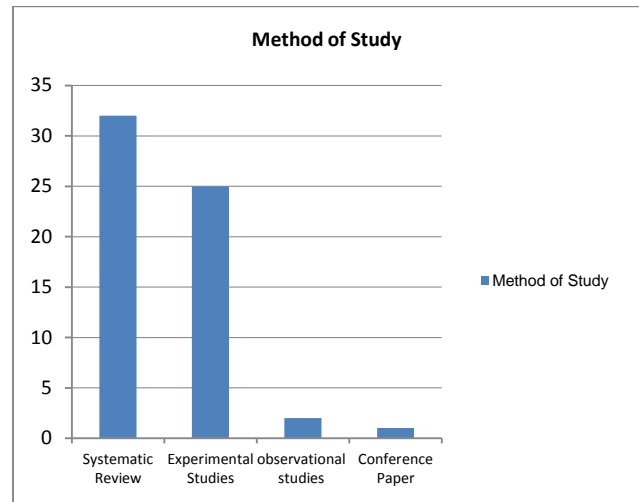


Figure 3: Method of studies included in review.

**DISCUSSION**

Honey's antimicrobial, anti-oxidant as well anti-inflammatory characteristics have been utilized to cure a wide range of diseases (Bizerra, Da Silva and Hayashi, 2012, Eteraf-Oskouei and Najafi, 2013). This is due to high osmolarity, acidic nature (low pH), hydrogen peroxide as well non-peroxide components of honey. Honey has antibacterial and anti-inflammatory properties by numerous studies (Albaridi, 2019). Honey's usage in dentistry has also been documented, however only a few cases have been linked to non- surgical periodontal therapy. Non-surgical Periodontal therapy aims to slow or stop the course of periodontitis while also reversing or preventing associated consequences. Scaling and root planing remove both diseased and healthy tissue (Alibasyah et al., 2018). After that, regeneration, repair, and the development of new attachments will occur. In responsive treatment, periodontal pocket measurement decreases. The Natural gel containing Honey are efficient at minimizing plaque during the periodontal recovery period (Puri et al., 2021). As an addition to periodontal treatment, subgingival irrigation with a honey is more successful than scaling and root debriment alone because of improving clinical status and reducing the load of P. gingivalis (Patil and Kumar Gudipaneni, 2016).

Periodontal surgery may be required in advanced instances with persistent periodontal pockets to minimize bacterial load with direct access debridement (Graziani et al., 2018). Encouraging dental hygiene habits and motivating patients are still required to considerably minimize plaque accumulation and, as a result, to help prevent disease development. Periodontal healing has been documented in patients with periodontitis, indicating that periodontal therapy improved periodontal health after scaling and root planing (Ali Alshehri and Javed, 2015). One probable cause is that honey is washed out by gingival crevicular fluid, which may affect its long-term viability in periodontal pockets (Zupančič et al., 2019). Deep pockets in periodontal disease have a high GCF flow rate (20-137l/h), according to the research. In the future researches honey might be administered more regularly into the pockets, or it could be put administered through fiber that into the periodontal pockets, allowing the honey to be released and kept longer to exercise its impact. As a result, more research on the appropriate dosage of honey is required for topical or local application. This review may merit more investigation in future research.

## CONCLUSION

Honey is a viscous natural material formed by bees from floral nectar. Honey has been utilized for wound healing and tissue inflammation in addition to being a nutritional source. According to scoping review, the studies revealed that Honey has antibacterial activity, antiplaque and anti-virulence action on a variety of organisms in oral cavities. This phenomenon is reliant on the concentration of Honey used. Honey can be used to prevent periodontitis, dental cavities, and gingivitis as traditional remedies as an alternative to standard therapies. Honey can be applied topically to change the pH, lower bacterial numbers, and stop bacterial growth. This literature review suggested that applying honey to the gums or ingesting honey could help reduce gingivitis caries and periodontitis. Some type of Honey shows equivalent or better activities against both gram-positive bacteria and gram-negative bacteria. Their potency suggests its use as a therapeutic agent for wound infection. Literature explained that it is the inhibitor of *S. pyogenes* and *P. aeruginosa* by down regulation of their virulence genes. The results obtained from the literature point out that Honey acts as an antibacterial and anti-virulence agent for the management and modulation of infections caused by these organisms. There is still a need for further investigation on its clinical efficacy and effect on the cellular and molecular level. Honey quickly heals the dehiscence wounds when used as a dressing. Finally, there is no strong evidence that locally given honey affects periodontal tissue healing. Despite this, all of the pockets had a good periodontal repair. Honey's efficacy in the treatment periodontal disease is still not well established and still questionable. To substantiate these findings from the literature, more research will be required.

**Recommendations:** As Honey is famous for its beneficial properties and readily available in all parts of our country. Experimental studies on this topic should be conducted in Pakistan to demonstrate the characterized and standardized to determine the exact efficacy, which revolutionized the non-surgical treatment of periodontitis.

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