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# REVIEW - IN VITRO EVALUATION OF THE ANTIBACTERIAL AND ANTIFUNGAL EFFECT OF *ZINGIBER OFFICINALE* MOUTHWASH AGAINST PERICORONITIS DISEASE

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***Abstract:*** Pericoronitis is inflammation of the soft tissue associated with the crown of partially erupted tooth. It is seen most commonly in relation to the mandibular third molar. The common symptoms and signs are pain, swelling, trismus, halitosis, bad taste inflammation of pericornal flap and pus discharge from underneath inflammation sometimes aggravated by trauma from an antagonist tooth. The microorganisms may involve in pericoronitis such as Streptococcus . sp, candida albicans is one of the most common opportunistic organisms, which cause oral cavity infections in humans .Most Antifungal and antibacterial drugs possess side effects and may have an undesirable taste. Ginger root is one of the oldest herbal products used in traditional medicine which has known antimicrobial effect and used in the manufacture of *Zingiber officinale* mouthwash. The present review was designed to investigate antimicrobial effect of Zingiber officinale mouthwash. In this study, the susceptibility of Streptococcus sp. and Candida albicans to Zingiber officinale was evaluated in comparison with commercially available mouth wash using disc diffusion method.

***Index Terms*** - Zinger root-Zingiber officinale root mouthwash-antimicrobial activity.

## I. INTRODUCTION

Pericoronitis refers to inflammation of the soft tissue in relation to crown of an incompletely erupted tooth, including the gingiva and dental follicle [Carranza et al]. The word pericoronitis comes from Greek word, “Peri” means “around”, Latin word, “corona” means “crown” and it is meaning inflammation. Maintenance of oral hygiene in such area is very difficult to achieve by normal methods of oral hygiene. It is most commonly seen in young adults. Pericoronitis symptoms express in redness and swelling of gum tissues, pus, follicle swelling, swollen lymph nodes in neck region. There is an increasing awareness of the disadvantages of alcoholic mouthwash formulation due to their harmful chemicals such as the Cetyl pyridinium Chloride [CPC] and therefore the prepared Ginger root based mouthwash will be an alternative [Dua K, et al.]. There is an increasing tendency towards replacing the commonly used alcohol based mouthwashes to safer products made from natural Ginger root as an ingredients that are less harmful and more benefit when compared to chemically prepared mouthwash. Several mouthwash companies are now trying to reduce the number of harmful chemicals in their chemically prepared mouthwashes which are replaced by formulating the mouthwash by natural ingredients to overcome the dental caries[Juman Nafea,et al..]. The herbal mouthwash contains ingredients like Ginger root, Cinnamon, Salt. This ginger will increase the serotonin and dopamine levels. This will reduce the inflammation in mouth. The most common oral diseases caries, gingivitis and periodontitis are based on microorganisms such as *Streptococcus mutant*, *Streptococcus milleri*, *Porphyromonas gingivalis*, *Candida albicans*, *Aspergillus sp etc..*, Pericoronitis disease is majorly caused by *Streptococcus mutants’* bacteria. Partial tooth impaction are the main cause of pericoronitis.When the tooth is partially trapped in your gums, bacteria can build up and lead to swelling and inflammation.

**ORAL MICROBIOTA:**

There are about 700 different kinds of microorganisms exits in human mouth. Oral microbiota can be used as targets to treat oral and systemic disease.[Jung IL et al]. In human oral, there is the presence of both bacteria and fungi. In fungi alone there are 85 species of fungi can be found in mouth. Among these fungi, the most important fungi involved in mouth is *Candida sp* [J.l.Baker]. *Candida sp* is the normal flora in oral. when the pericoronitis initiates, the candida sp become an opportunistic pathogen to attack oral tissue [X.Wang et al].]

The oral microbiota is an important part in human microbiota. This oral microbiota includes several hundred or several thousands of different species which comprises several facts. Mostly the Oral microbes loaded in human mouth saliva and soft tissues of tongue, mucosa membrane and hard tissues of the tooth[Nicole B et al]. Detection of oral microbes is according to their age and microorganism changes in mouth.

The human oral cavity microbiota is an ecosystem consisting of various symbiotic microbes. There is a relationship between the global composition of indigenous bacterial population and human health[Garg et al]. A vast range of microorganism in habit the human oral cavity, including bacteria, fungi, viruses and protozoa[Baker et al]. The basic oral microbiota consists of phyla, such as proteobacteria, fusobacteria and actinobacteria. The most dominant genera are *Streptococcus sp, Neisseria sp, Selenomonas sp, Fusobacterium, Leptotrichia sp and Porphyromonas* [Katarzyna et al]. The oral microbiota research is a relationship, between humans and their oral microbiota begins shortly after birth and lasts a lifetime. The association between the host and oral bacteria were considered in term of a multiplicity of single species interaction oral health or disease depends on the interface between the host and the microbial community as a whole. Although it is important to continue studies of the pathogenic properties of specific microbes. Understanding the microbial communities that drive sickness or health is a key to comparing human oral disease. [Jenkinro et al..,]. Pericoronitis refer to inflammation of the soft tissue in relation to the crown of an incompletely erupted tooth, include gingiva and the dental follicle.

Pericoronitis means inflammation it is also known as operculitis. The soft tissue covering over a partially erupted tooth is known as pericoronal. Methods of oral hygiene it is most commonly seen in relation to the third molar, also called as wisdom tooth, particularly of mandibular arch, but it can occur around any tooth that has not erupted completely. It is most commonly seen in teens and young adults. The highest incidents was found in the 20-29 year age groups and rarely seen before 20 or before 40. Pericoronitis mostly seen with involved tooth of 67% vertical impacted cases in 12% of mesio-angular cases, in 14% of distoangular cases and in 7% of various other position [Roshan et al].

Table :1 Table shows the different types of bacteria and fungi in oral carries.

| | **Bacteria** | **Fungi** |
|---|---|---|
| **Oral microbes** | *Streptococcus mutants* | *Candida albicans* |
| | *Staphylococcus aureus* | *Aspergillus fumigates* |
| | *Lactobacillus sp* | *Aspergillus niger* |
| | *E.coli* | *Cryptococcus sp* |

Dental carries in usually associated with increased numbers of *Streptococcus mutants* and *Lactobacillus sp* which indicates the formation of pericoronitis gum tissue inflammation, Estimation of salivary levels of these organisms maybe useful for assessing tooth carries risk in the passion and monitoring the response to preventing measures[A.C.Tunner et al]

**Virulence of gum tissue inflammation:**

According to the International classification of disease, pericoronitis can be classified as an,

1. Acute pericoronitis
2. Chronic pericoronitis

**ACUTE PERICORNOTIS**

Acute pericoronitis is sudden onset, short lived but having significant symptoms such as tissue inflammation, fever, severe pain around back teeth, discomfort when swallowing food, swollen lymph nodes in neck. Usually, the acute form pericoronitis is seen in the passion having moderate or poor oral hygiene. Patients with early stage periodontitis report: pain, intro-oral swelling, redness, Mucosal ulceration and loss of functional. It is cure easy, cheap, quick and no need for systemic antibiotics if detected early and appropriately[Schmidt et al]. The proper treatment on the initial face is the local therapy antibiotic[Schalch et al].

**SUB-ACUTE PERICORONITIS :**

Sub-acute pericoronitis also associated with the report of the pain associated with the local inflammatory process [MO Folayan et al]. It is a frequent cause of dental pain, particularly in the lower third molar region and it is characterized by some constitutional disturbance.

**CHRONIC PERICORONITIS :**

Acute pericoronitis is inflammation of the gum tissue around wisdom teeth. This can happen when a tooth is still partially impacted. Pericoronitis symptoms range from mild to severe and may include bad breath, Pus and Swelling. Left untreated pericoronitis can be dangerous. Chronic inflammation is a complex biological process that occurs in response to infection and leads to tissue injury. Chronic pericoronitis is pericorontal disease which is characterized by oral microbes and proinflammatory events from innate and adaptive immunity[Yucel-Lindberg et al].

**RISK FACTORS FOR PERICORONITIS:**

- Presence of unerupted/ partially erupted tooth/ teeth in communication with the oral cavity. Mandibular third molar(which are placed vertical and distoangular) are most commonly affected.
- Presence of periodontal pocket adjacent to unerupted or partially erupted tooth.
- Poor oral hygiene status of individuals.
- Respiratory track infections and tonsils.

**FEATURES:**

**1.Etiology**

The most common case of pericoronitis is entrapment of food debris and plaque between the crown and the over lying operculum. This constant entrapment of plaque and food debris leads to inflammation this may also called gum tissue infection, which aggravates pain, redness and also leads to release of an inflammatory fluid and cellular exudate. The cases incomplete closer of jaw due to the opposing cusps of normally erupted or supra erupted third molar. Chronic condition is characterized by varying degrees of ulceration it also related to systemic conditions like upper respiratory tract inflammation like tonsilitis, influenza and stress leading to immunocompromised state[Balakrishnan et al].

**CLINICAL FEATURES**

Both acute and chronic pericoronitis is characterized by pain, redness, swollen, tender, throbbing in nature radiates to ear, temporomandibular joint and submandibular region, making the patient unable to sleep. This leads to systemic conditions like pyrexia, leukocytes, regional lymphadenopathy with a diffuse spread to tissue spaces. Chronic pericoronitis is characterized by dull pain, which last for few days with recurrence of symptoms lasting for months[Wasm Ahmed et al].

**HISTOPATHOLOGY**

There is a presence of hyperplastic epithelium lining of pericoronal flap with intracellular edema and leukocytic infiltration along increased vascularities underneath epithelium. There is also a presence of polymorphonuclear leukocytes within connective tissue of inflammated pericoronal flap[Vijayebenezer et al].

**MORPHOLOGY**

The bacterial species which are predominant in pericoronitis in mandibular third molars are *Streptococcus mutants, Streptococcus pyogens, E.coli, Candida, Aspergillus niger, Aspergillus fumigatus, Porphoromonas gingivalis, Streptococcus milleri* and *Actinomycetes*. The bacterial and fungal species of pericoronitis are aerobic. The colony morphology in bacteria were seen in pericoronitis are similar to those in tonsilitis and periododitis. Polymerase chain reaction has been shown highly sensitive and specific test for detection of periodontopathogens in pericoronal infection site.

**MANAGEMENT**

1. Conservative method
2. Surgical removal method

**CONSERVATIVE METHOD**

1. Warm salt water rinse
2. Oral water irrigators
3. Good oral hygiene including brushing and flossing.
4. Over the counter pain relievers.

You can gently brush the affected area to loosen up the plaque and bacterial build up area. Elevate the flap gently from the tooth with scaler and swab the area with an antiseptic. If pericoronitis is severe are systemic symptoms are present, antibiotics, either metronidasole 400mg twice a day or penicillin 500mg thrice a day for 5 days. Patients who have allergy with using penicillin are advised to take erythromycin 500mg thrice a day for 5days.(1)

**SURGICAL REMOVAL METHOD**

The operculum, soft tissue covering erupting third molar, can be removed to eliminate the deep pocked formed between gingiva the tooth. The tissue overlying the occlusal surface of lower third molar tooth is a dense fibrous one called as operculum. The inflammated tissue is also called as operculutitis infiltrated with inflammatory cells. It is removed with the help electrosurgical scalpal or radiosurgical loop. This procedure is performed when the pericoronitits is severe and cannot be resolved by antibiotic and therapy.(Gloria Kwol et al.,)

**ROLE OF GINGER ROOT EXTRACT IN PERICORONITITS**

The main role of ginger root extract is both antibacterial, antifungal and anti-inflammatory activities which may important role in pericoronitis gum tissue inflammation. Ginger root extract is an alternative herbal medicine for use an anticancer agent. Ginger root to cure the wound healing infections. Ginger root extraction are used as herbal medicine in pericoronitic product for the pericoronitits benefits. The ethanol extract of ginger root extract has an anti-inflammatory effect on male white rats [Mohd Allem et al]. Ginger root ethanol extraction have anti-inflammatory property.

This ginger root extract has helps to suppress the growth of pericoronitis bacterial infection like mutants *Streptococcus milleri, Streptococcus pyogens, E.coli and Streptococcus*. Ginger plant has antimicrobial properties on their root, stem, rhizome. This herbal ginger root act an antimicrobial agent in pericoronitis or tissue inflammation tooth caries, namely bacteria like *porphyromonas gingivali, Streptococcus mutants and Streptococcus milleri.* Hence the ginger root extract has an antibacterial activity against pathogenic bacteria and pericorondial.

Table:2 Ginger parts bioactive components and functions

| **Ingredients** | **Plant Part** | **Functions** |
|---|---|---|
| Cinnamon | Bark | Flavoring agent and antibacterial activity |
| Salt | - | Osmolytic preservative |
| Rosemarry oil | Flowers | Antibacterial and antifungal activity. |
| Ginger root | Root | Anti-inflammation and analgetic. |

**ANTIMICROBIAL ACTIVITY OF GINGER ROOT EXTRACT**

Ginger root has rich in anti-bacterial activity against the gum tissue inflammation causing microbes. Use of medicinal plant natural ingredient to cure the disease related to pericoronitis. Plant are used as medicine for human health benefits and they contain beneficial phytochemicals (gingerol, parasol, shogaols) this activities present against the pathogenic bacteria and fungi[Mond Aleem et al.,]. The antimicrobial properties found in this ginger root which makes this plant widely used in denistry. Ginger plant root, stem, rhizome, leaves have their tremendous benefits for human. The use of herbal based ginger plant used in dentistry act as an antimicrobial property against pericoronitis bacterial infection [Fasihur et al].

The main reason for the ginger root is used for the slowing down the growth of bacteria and reducing gingivitis, the ginger can speed up the recovery process that comes with treatment. The antimicrobial properties of ginger root is used to formulate antibiotic for pericoronitis causing pathogens. This ginger based

herbal product may be mouthwash which inhibit the growth of bacteria which is responsible for the formulation of gum tissue inflammation[Fasihur Rehman Ansari et al].

## ANTIINFLAMMATORY ACTIVITY OF GINGER ROOT

Human health is the only important factor In most cases oral health was neglected. Oral health is also an important factor which plays major role in determining the quality of human life and this Pericoronitis infection is more common disease in human life, but its cause major defect in healthy life [Jirawan Onmetta-gree et al]. To avoid the gum tissue inflammation issues, herbal based things can be used as medicine. Ginger root has distinct properties which act as medicine for health. Ginger plant has the anti-inflammatory properties which normal protective response mechanisms against tissue caused by microbial agents. Ginger root naturally had an anti-inflammatory effect due to the presence of secondary metabolites that contains gingerol which had the bioactive component called as flavonoids. Ginger root extraction has the good action against anti-inflammatory activities and useful in healthy oral hygiene.

## FORMULATION OF MOUTHWASH

Formulating herbal based mouthwash against Pericoronitis infection by carcinogenic bacteria. Mouthwash are formed by composition of ginger root extract and the remaining materials were added and the components were separated by using Soxhlet apparatus the mouthwash has been prepared. The mouthwash was analyzed by using physical and biological activity of mouthwash. Shafiahmad et al].

## CONCLUSION

The present review states that *Zingiber officinale* extract work in long way to help people to get rid of bad breath and many oral disorders**.** This *Zingiber officinale* extract had an ability to kill pericoronitis, gum tissue inflammation and gingivitis causing microorganisms such as *Streptococcus mutant, Streptococcus milleri, Candida albicans, Aspergillus.sp*. The ginger naturally have a gingerol bioactive component which is helpful to kill the oral infecting microbes. The natural herbs used in present formulation have been medicinally proven to prevent the problem of oral hygiene and bad breath. Person can easily rinse these extract of herbals product such as mouthwash can stay clear of wide variety of oral health issues.[Matthews RW et al].

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