

A Review on: “Role of Amoxicillin-Clavulanate in Odontogenic(Dental)infections”

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➤ **ABSTRACT:-**

Antibiotics are commonly used in dental practice. It has been estimated that 10% of all antibiotic prescriptions are related with dental infections. Treatment of odontogenic infection includes surgical drainage and adjunctive antibiotics. This study was designed to generate efficacy and safety data to support twice daily dosing of amoxicillin/clavulanic acid compared to Clinician in odontogenic infections. The association amoxicillin-clavulanate was the drug most frequently prescribed by dentists during 2005, at least in the Valencian Community (Spain). The use of antibiotics in dental practice is characterized by empirical prescription based on clinical and bacteriological epidemiological factors, with the use of broad spectrum antibiotics for short periods of time, and the application of a very narrow range of antibiotics. The simultaneous prescription of nonsteroidal antiinflammatory drugs (NSAIDs) can modify the bioavailability of the antibiotic. In turn, an increased number of bacterial strains resistant to conventional antibiotics are found in the oral cavity. Antibiotics are indicated for the treatment of odontogenic infections, oral non-odontogenic infections, as prophylaxis against focal infection, and as prophylaxis against local infection and spread to neighboring tissues and organs. Pregnancy, kidney failure and liver failure are situations requiring special caution on the part of the clinician when indicating antibiotic treatment. The present study attempts to rational antibiotic use, with a review of the general characteristics of these drugs.

➤ **KEYWORDS:-**AmoxicillinClavulanate, NSAID,Gingivities,Pulpitis,Dentalcaries,Peridontitis,Augmentin,Amoxiclav,Cinnamon.

➤ **INTRODUCTION: -**

Odontogenic infections are one of the most prevalent diseases worldwide and the principal reason for seeking dental care. Dental prescriptions account for nearly 7% to 11% of all common antibiotic prescriptions . The commonest emergency odontogenic infections are periapical abscess (25%), periodontitis (11%), and periodontal abscess (7%) Odontogenic infections are mostly microbial and frequently encountered pathogens are *Streptococci* spp., *Bacterium* spp. and *Staphylococcus* spp., *Propionibacterium* spp., *Anthropomorphous* spp., *Bacterium* spp., and *Bactericidal* spp. Therapeutic success in odontogenic infections is determined by the control of infection by surgical debridement and/or antimicrobial therapy which is indicated when there are clear signs of systemic involvement such as Pyrexia or lymphatic . The microbial nature of odontogenic infections

necessitates the use of antibiotics active against both aerobic and anaerobic bacteria.

The antibiotics most commonly prescribed for acute dental abscesses are amoxicillin, penicillin, metronidazole, and erythromycin with clindamycin . The inflammatory process may be caused by any pathogenic flora which is present in the mouth cavity. We have talked about the main infection agents of the mouth cavity. As amoxicillin acts on most infection agents of the mouth cavity, its administration is the most useful. The antibacterial therapy may replace the drain tube and the drain of the inflammation, if the use of amoxicillin was started during the first signs of the tooth abscess or given abscess. Pain is gradually reduced during the reduction of the purulence and the inflammation. If the pain is severe and bothers a patient to eat, it is recommended to take non-steroid anti-inflammatory drugs which will help to decrease pain and relieve the course of the therapy in addition to amoxicillin But more than half of the Gram-negative anaerobic bacilli (including *Propionibacterium*, *Anthropomorphous*, *Bactericidal*, and *Bacterium* spp.) are capable of producing beta-lactamase leading to treatment failures in dental infections . Studies have revealed the presence of beta-lactamase producing species in 74–88% of patients with periodontitis . Addition of a beta-

lactamase inhibitor such as Clavulanate-Induced acid to amoxicillin (Augmentin) confers resistance to beta-lactamases thereby extending the antibiotic spectrum to anaerobes such as *Prevotella* spp. and *Bacteroides* spp. anaerobes and to *Staphylococcus* spp. The aim of current study was to assess the clinical efficacy and safety of amoxicillin/Clavulanate-Induced acid

➤ TYPES OF DENTAL INFECTIONS :-

There are several types of tooth abscess/infections. Each type occurs in a different area for a different reason. The types of tooth abscess include:-

1.Periapical abscess: -it is the most common type. A periapical abscess occurs at the root tip as a result of untreated dental caries, crack, or trauma. Bacteria invade the pulp through dental caries or crack in the tooth, causing inflammation of the pulp tissues and the formation of the abscess at the root tip.

2.Dental caries:- Tooth decay, also known as dental caries or cavities, is a breakdown of teeth due to acids made by bacteria. The cavities may be a number of different colors from yellow to black.

3.Gingivitis:- this type usually occurs when foreign-body or food is trapped in the space between the tooth and the gum near the coronal part of the gum. To treat the gingival abscess, your dentist will remove the trapped foreign-body or food and clean the area with saline (salt water).

4.Peridontitis -it usually occurs within the gum tissue covering a partially erupted or impacted tooth. The pericoronal abscess is usually associated with impacted or partially erupted lower wisdom tooth. The treatment includes the removal of gum tissue covering the wisdom tooth or the extraction of the wisdom tooth.

5.Pulpitis- is a pathological condition of the tooth wherein the pulp becomes inflamed which cause pain and pressure. Once the tooth pulp becomes inflamed, it irritates the nerves and connective tissue in the tooth, and in severe cases, the pain is felt referred to areas other than the direct source of the inflammation. Pain referral can be felt in the face and the mouth.

➤ EPIDEMIOLOGY OF DENTAL INFECTIONS-

Dental caries and periodontal diseases are historically known as the top oral health burden in both developing and developed nations affecting around 20–50% of the population of this planet, and is the uppermost reason for tooth loss . Among Indian patients over 30 years of age it has been reported that the significant (almost 80%) cause of loss of teeth is due to periodontal disease . Multiple studies reported that in Asia, the Middle East, and across the African sub-Saharan regions, dental caries is a principal public oral health threat. Though some studies state that globally dental caries has declined in the population especially in modern countries, other recent research reports that there is a significant increase in rates of caries

Another Indian study said that periodontal disease is widespread in the Eastern Indian state of West Bengal. One Libyan study conducted among a population of 1225 subjects aged 18–34 years, revealed that only 5% population had healthy periodontium . Multiple studies reported that periodontal disease occurrence and severity increases with patients' age Additionally, periodontal diseases occur more often in males and individuals with poor oral hygiene practice . Pediatric and adult groups of males were more often sufferers of dental infections and other infections of the oral cavity in comparison with the female population of both rural and urban communities. One Dutch study revealed that the incidence of caries decreased in the period of 1990–2009 among an 8–21-year-old studied population in both low and high socioeconomic cluster and was also statistically significant . Similarly, another British study conducted among 69,318 children aged 5–15 years revealed a 31–51% reduction of caries in the last 40 years (1973–2013). This study also reported a greater reduction among 15-years age group. Additionally, the British study concluded that although there is a significant improvement, caries continues to be a significant liability to the national healthcare system . In Norway, prevalence of caries decreased from 81% to 52.2% in a 15-year period (1985–2000) among 12-year-old children. However, the next 4 years (2001–2004) the prevalence increased to 59.8% with cavity The human oral flora encompasses over 700 microorganisms,

and 50% of those microorganisms are uncultivable microbes. The different anatomic areas and its bathing fluid, saliva of the oral cavity, possess oral microbiome comprising the normal oral flora which includes bacteria, archaea, fungi, protozoa, and viruses. These oral microbiomes usually swim in saliva as free-floating microorganisms and form a complex ecological community of biofilm, attaching to different surfaces of the mouth cavity Biofilm is often responsible for several local and systemic diseases

One Japanese study reported that diverse infection of strict anaerobes with facultative anaerobes, especially commensal streptococcal gram-positive bacteria known as viridans streptococci, was identified as the principal pathogens responsible for dentoalveolar infections, periodontitis, and pericoronitis .

➤ **SYMPTOMS OF DENTAL INFECTIONS**

- 1).Bad breath
- 2).Gum soreness
- 3).Facial swelling
- 4).Swollen jaw
- 5).Fever and general uneasiness.
- 6).The infected tooth is sensitive to very cold or hot foods.
- 7).Swelling of the lymph glands present in the neck area is also manifested as a response to bacterial infection in the tooth.
- 8).Over time, infection in and around the tooth leads to accumulation of pus in the pulp of the tooth, and also in the tissues surrounding the affected tooth. You might notice a strange taste in your mouth (pus taste).
- 9).Speaking about wisdom tooth infection symptoms, the most prominent signs are inflammation and puffiness of the gum tissues around the infected tooth. At times, pus draining from the gum line and swelling of the lymph glands under the jaw line are observed.
- 10).Mild to severe toothache is the most common symptom of tooth infection. The pain may be acute or chronic, depending upon the location and severity of the infection. Some patients experience a continuous pain, while others complain of throbbing or sharp pain. The pain may worsen while indulging in chewing or mastication activities.
- 11).It is also not unusual to manifest infection at the tooth extraction site. After all, the procedure involves injuring the tissues and blood vessels in the particular area. Some of the tooth extraction infection symptoms are pain, redness, swelling, and pus formation.

➤ **PRINCIPAL OF TREATMENT OF DENTAL INFECTIONS:-**

MANAGEMENT ODONTOGENIC INFECTIONS	
Surgical /mechanical debridement	Antibacterial/ antibiotic therapy
1.Dental drilling/ Filling	1.Penicillins
2.Root canal therapy	2.Macrolides
3.Tooth Extraction	3.Tetracyclins
4.Crowns	4.Antibacterial mouthwash
5.Bone grafting	5.Antibacterial tooth pastes

➤ COMMONLY USED ANTIBIOTICS IN DENTAL INFECTIONS:-

- 1) Penicillin is the drug of choice for dental infection (Penicillin G administered parenteral, Penicillin V delivered orally)
- 2) Erythrocyte is a second choice and will become the first selection in patients who have an allergic reaction to penicillin.
- 3) Phosphorescence can be used if Erythrocyte cannot be used, but their cost is higher than other groups and lack of advantage over other drugs.
- 4) Clinician administered orally or Lincoln administered parenteral are for treatment
- 5) of bone and anaerobic infections. Clinician is very efficient against all photogenic pathogens, but its potential gastrointestinal toxicity makes the drugs unfavorable to use.
- 6) Tetracycline is the third choice for dental infections for patients over the age of 13. However, they are useful in the treatment involving gums such as acute concertizing curative gingivitis
- 7) Metropolitan (Flagella) has excellent activity against anaerobic gram-negative bacilli, it is only moderately effective against fricative and anaerobic gram-positive cocci, and
- 8) should not be used alone in the treatment of acute photogenic infections.
- 9) Streptomycin and Aureomycin are used eclectically for the prevention of infective appendicitis in patients with prosthetic heart valves.
- 10) Statistic is a first-choice for treatment of oral Candida infections
- 11) Endoskeleton, an anti fungal drug, may be used for Mongolia infections of the oral cavity refractory to Statistic

Table 1. Antibiotics commonly used in application to odontogenic infections.

Drug substance	Administration route	Posology	Side effects
Amoxicillin	po*	500 mg/8 hours 1000 mg/12 hours	Diarrhea, nausea, hypersensitivity reactions
Amoxicillin-clavulanic acid	po or iv **	500-875 mg/8 hours* 2000 mg/12 hours* 1000-2000 mg/8 hours**	Diarrhea, nausea, candidiasis, hypersensitivity reactions
Clindamycin	po or iv	300 mg/8 hours* 600 mg/8 hours**	Pseudomembranous colitis
Azithromycin	po	500 mg/24 hours 3 consecutive days	Gastrointestinal disorders
Ciprofloxacin	po	500 mg/12 hours	Gastrointestinal disorders
Metronidazole	po	500-750 mg/8 hours	Seizures, anesthesia or paresthesia of the limbs, incompatible with alcohol ingestion
Gentamycin	im*** or iv	240 mg/24 hours	Ototoxicity Nephrotoxicity
Penicillin	im or iv	1.2-2.4 million IU/24 h*** Up to 24 million IU/24 hours**	Hypersensitivity reactions, gastric alterations

*po:oral route; **iv:intravenous route; *** im:intramuscular route.

➤ CRITERIA FOR ANTIBIOTIC AND ANTIBACTERIAL AGENTS:-

- 1) Eliminate causative organism
- 2) Rapid absorption and distribution
- 3) Consistent high blood level
- 4) Penetration to achieve high level in periodicity bone and soft tissues
- 5) Low risk of side effects
- 6) Speciation and susceptibilities are available .
- 7) Oral agents are highly bioavailable

- 8) Hemodynamically stable
 9) Oral agents has a low acquired-resistance potential for given pathogens.

➤ **TREATMENT OF AMOXICILLIN- CLAVULANATE IN DENTAL INFECTIONS:-**

Amoxicillin-clavulanate is one of the most frequently used antibiotics in emergency departments and primary care offices throughout the country. It is a combination of two separate drugs: amoxicillin and clavulanic acid. Amoxicillin is a penicillin derivative and has similar activity against both gram-positive and gram-negative bacteria, including *Enterococcus* species, *Listeria monocytogenes*, *Streptococcus* species, *Haemophilus influenzae*, *Moraxella catarrhalis*, *Corynebacterium diphtheria*, *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella*, *Shigella*, and *Borrelia* species. Furthermore, with the addition of clavulanic acid, the spectrum is increased to include all beta-lactamase-producing strains of the previously mentioned organisms, as well as broadening the coverage to include methicillin-sensitive *Staphylococcus aureus*, *Neisseria* species, *Proteus* species, *Pasteurella multocida*, and *Capnocytophaga canimorsus*, among others

Amoxicillin-clavulanate has FDA approval for the treatment of aspiratio pneumonia,community-acquired pneumonia, acute bacterial rhinosinusitis, urinary tract infections, acute otitis media, and skin and soft tissue infections. Off-label uses include the treatment of human or animal bite wounds, group A streptococcal infections, impetigo, acute exacerbations of chronic obstructive pulmonary disease and bronchiectasis, diabetic foot infections, odontogenic infections, and peritonsillar cellulitis/abscess

➤ **MECHANISM OF ACTION OF AMOXICILLIN-CLAVULANATE IN DENTAL INFECTIONS:-**

Amoxicillin is a broad-spectrum beta-lactam antibiotic, originally derived from penicillin. It is a bactericidal agent that targets and kills bacteria by inhibiting the biosynthesis of the peptidoglycan layer of the bacterial cell wall. This layer makes up the outermost portion of the cell wall and is responsible for the structural integrity of the cell. Peptidoglycan synthesis involves the facilitation of enzymes called DD-transpeptidases, which are a type of penicillin-binding protein (PBP). Amoxicillin works by binding to these PBPs and inhibiting peptidoglycan synthesis, which interrupts the construction of the cell wall and ultimately leads to the destruction, or lysis, of the bacteria.

Clavulanic acid is a beta-lactamase inhibitor often used in conjunction with amoxicillin to broaden its spectrum further and combat resistance. It has little to no antimicrobial activity of its own and instead works by preventing bacterial destruction of antibiotics. Over the years, certain bacteria have evolved to develop resistance to standard beta-lactam antibiotics through the production of enzymes called beta-lactamases. These enzymes target and hydrolyze the beta-lactam ring, which is necessary for penicillin-like antibiotics to work. Clavulanic acid prevents this degradation by binding and deactivating the beta-lactamases, thus restoring the antimicrobial effects of amoxicillin.

➤ **ADMINISTRATION:-**

Amoxicillin-clavulanate is only available in oral formulations and like most bactericidal antibiotics, needs to be administered at regularly scheduled intervals to minimize differences in the antibiotic's peaks and troughs. This approach helps maintain consistent serum concentrations over the minimum inhibitory concentration (MIC) needed to destroy the targeted organism effectively; this is generally accomplished by a twice or three times daily administration of the medication. Oral formulations of this antibiotic are available as immediate or extended-release tablets, reconstituted suspensions, or chewable tablets. The reconstituted solution should be kept in the refrigerator and shaken well before the administration to maximize its longevity and effectiveness. It is recommended to take this antibiotic with food to enhance its absorption as well as minimize any adverse GI symptoms

➤ **SPECIAL PRECAUTIONS SHOULD TAKEN BEFORE TAKING THIS MEDICATIONS:-**

- ✓ tell your doctor and pharmacist if you are allergic to amoxicillin (Amoxil, Trimox, Wymox), Clavulanate-Induced acid, penicillin, Phosphorescence, any other medications, or any of the ingredients

in amoxicillin and Clavulanate-Induced acid preparations. Ask your pharmacist for a list of the ingredients.

- ✓ tell your doctor and pharmacist what prescription and nonprescription medications, vitamins, nutritional supplements, and herbal products you are taking. Be sure to mention either of the following: allopurinol (Aloprim, Lopurin, Zyloprim) probenecid (Probalan), and warfarin (Coumadin, Jantoven). Your doctor may need to change the doses of your medications or monitor you carefully for side effects.
- ✓ tell your doctor if you have or have ever had kidney or liver disease, allergies, asthma, hay fever, hives, or mononucleosis.
- ✓ you should know that amoxicillin and Clavulanate-Induced acid may decrease the effectiveness of oral contraceptives (birth control pills). Plan to use another form of birth control while taking amoxicillin and Clavulanate-Induced acid.
- ✓ tell your doctor if you are pregnant, plan to become pregnant, or are breastfeeding. If you become pregnant while taking amoxicillin and Clavulanate-Induced acid, call your doctor.

➤ **STORAGE AND DISPOSAL OF THIS MEDICATION:-**

- ✓ Keep this medication in the container it came in, tightly closed, and out of reach of children.
- ✓ Store the tablets at room temperature and away from excess heat and moisture (not in the bathroom).
- ✓ keep liquid medication in the refrigerator, tightly closed, and dispose of any unused medication after 10 days.
- ✓ Do not freeze.
- ✓ It is important to keep all medication out of sight and reach of children as many containers (such as weekly pill minders and those for eye drops, creams, patches, and inhalers) are not child-resistant and young children can open them easily.
- ✓ To protect young children from poisoning, always lock safety caps and immediately place the medication in a safe location – one that is up and away and out of their sight and reach.
- ✓ Unneeded medications should be disposed of in special ways to ensure that pets, children, and other people cannot consume them.
- ✓ However, you should not flush this medication down the toilet. Instead, the best way to dispose of your medication is through a medicine take-back program.
- ✓ Talk to your pharmacist or contact your local garbage/recycling department to learn about take-back programs in your community.

➤ **IN CASE OF OVERDOSE/ EMERGENCY OF AMOXICILLIN-CLAVULANATE:-**

Dentists prescribe medications for the management of a number of oral conditions, mainly orofacial infections.

- 1) Since most human orofacial infections originate from photogenic infections,
- 2) the prescribing of antibiotics by dental practitioners has become an important aspect of dental practice. For this reason, antibiotics account for the vast majority of medicines prescribed by dentists
- 3) Dentists prescribe between 7% and 11% of all common antibiotics (betalactams, macrolides, tetracyclines, Clinician, Metropolitan
- 4) On the other hand, the National Center for Disease Control and Prevention estimate that approximately one-third of all outpatient antibiotic prescriptions are unnecessary
- 5) Antibiotic prescribing may be associated with unfavorable side effects ranging from gastrointestinal disturbances to fatal anaphylactic shock and development of resistance. The increasing resistance problems of recent years are probably related to over- or mis-use of broad-spectrum agents such as Phosphorescence and fluoro-quinolones.

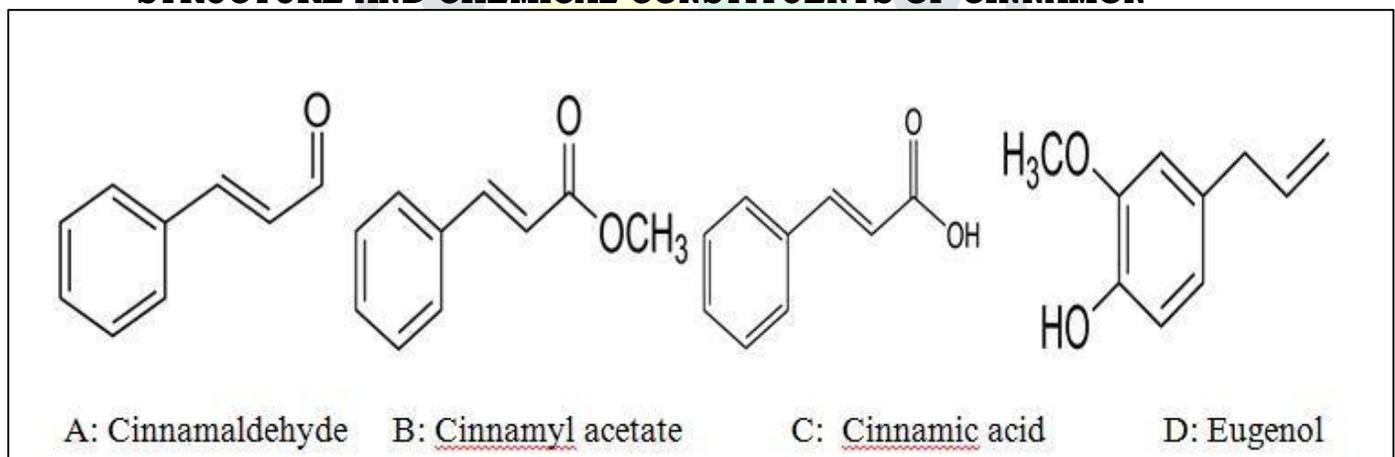
➤ RECENT TRENDS ON AMOXICILLIN-CLAVULANATE:-

★ Role of Cinnamon Extract in the Protection against amoxicillin-Clavulanate-Induced Liver Damage in Rats

amoxicillin/Clavulanate-Induced (AC), which is effectively used in the treatment of several number of bacterial infections, may cause hepatotoxicity. Cinnamon extract contains natural products which showed antioxidant, anti-inflammatory and anti-bacterial properties. In the present study, two doses of AC, therapeutic (30 mg/kg) and double therapeutic (60 mg/kg), were orally given to rats alone or in combination with cinnamon (200 mg/kg) for 10 consecutive days, to test the potential protective impact of cinnamon extract against AC-induced hepatic injury. Obtained results showed significant increases in serum levels of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), γ -glutamyltransferase (GGT) and total bilirubin in rats treated with AC. Hepatic contents of malondialdehyde (MDA), protein carbonyl (PC), hydrogen peroxide (H₂O₂) and nitric oxide (NO) were also markedly increased following administration of AC. On contrary, treatment with AC produced significant decreases in the hepatic levels of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione reductase (GRd), glutathione-s-transferase (GST) and reduced glutathione (GSH). The drug was also found to induce upregulation of pro-apoptotic p53 and caspase-3 proteins expression, while it downregulated the expression of the anti-apoptotic protein Bcl-2 in the liver of treated rats. AC-induced adverse effects in all investigated biochemical indices seemed to be dose-dependent. However, administration of cinnamon extract along with AC to rats reduced liver injury, oxidative stress and apoptosis caused by treatment with AC alone. It could be concluded that cinnamon extract may be useful in the protection against AC-induced liver damage in rats.

INTRODUCTION:- Amoxicillin is a semi-synthetic penicillin which has been effectively used as antibiotic in the treatment of various bacterial infections. It possesses a potent anti-bacterial effect against all of gram negative as well as most of the gram positive bacteria. The drug has been combined with Clavulanate-Induced acid .

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Although AC has become one of the most widely prescribed antibiotics, the administration of the drug might be associated with liver injury, which appeared to be primarily due to the Clavulanate-Induced component. Previous studies showed marked increases in the activity of serum transaminases, ALP and total bilirubin following treatment with AC. However, liver injury pattern which associated with AC was classified to be cholestatic, hepatocellular and mixed, with signs of hypersensitivity in some cases. It has been suggested that oxidative stress plays a central role in the pathogenesis of AC-induced liver injury. In previous studies, administration of AC in rats increased lipid peroxidation and reduced levels of GSH, Action of Cinnamon Extract in the Protection against amoxicillin/Clavulanate-Induced Liver Damage :-

SOD, CAT and GSH-dependent enzymes in the liver. Also, treatment of isolated chicken primary hepatocytes with lipopolysaccharide/amoxicillin Clavulanate-Induced potassium (LPS/AC) produced increases in reactive oxygen species and lipid peroxidation, and decrease in activities

of antioxidant enzymes. Moreover, LPS/AC increased the apoptotic cells and biomarkers of cell death in the treated cells. Cinnamon (*Cinnamomum zeylanicum*) is a tropical evergreen tree belonging to the family Lauraceae. The bark of various cinnamon species is one of the most important and popular spices used worldwide for both cooking, and traditional and modern medicines. Cinnamon has strong neuroprotective, hepatoprotective, cardioprotective gastroprotective effects due to its potent antioxidant and anti-inflammatory properties. The antioxidant activity and the beneficial health effects of cinnamon bark is attributed to the presence of polyphenolic component like proanthocyanidins. Furthermore, cinnamon extract exerted anti-apoptotic effect through modulating the in apoptotic markers induced by chemicals such as cisplatin. On the other hand, cinnamon and its oils, like AC, showed anti-bacterial activity. Based on the ability of cinnamon to exert antioxidant, anti-inflammatory and anti-bacterial actions, this study was undertaken to examine, the potential protective impact of ethanolic extract of cinnamon bark against AC-induced hepatotoxicity in male albino rats.

[ABBREVIATIONS]:-(AC):Amoxicillin clavulanate ,(ALT):Alanine aminotransferase,(AST):Aspartate aminotransferase,(ALP):Alkaline phosphatase,(GGT): γ -glutamyltransferase ,(MDA):Malondialdehyde ,(PC):Protein carbonyl,(NO):Nitric oxide,(SOD):Superoxide dismutase ,(GPx):Glutathione peroxidase,(GST):Gutathione-s-transferase,(GRd):Glutathione reductase ,(LPS):Lipopolysaccharide

➤ **CONCLUSION:-**

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- ✓ ental infections and its complications position a substantial burden on individuals, communities, and the health-care system; hence, early diagnosis and appropriate intervention are extremely important. Determination of various host and environmental factors that put an individual at risk for development of dental abscess, influence the spread of infection from a localized collection at the apex of a tooth to a cellulitis and further life-threatening sepsis would aid treatment decisions. At present, there are standard treatment as evidenced by the wide variety of surgical protocols and prescription of antibiotic.
- ✓ Amoxicillin-clavulanate is an important and effective antibiotic but its use must be reserved for specific indications in order to reduce the rate of antimicrobial resistant infections, Amoxicillin-clavulanate has only a few indication where it is recommended as first line antibiotic eg- diabetic foot infections ,pneumonia and acute dental infection .
- ✓ Most odontogenic infections are mixed infections, often involving strictly anaerobic bacteria, which are frequently beta-lactamase producers² Addition of a β - lactamase inhibitor such as clavulanic acid to amoxicillin (amoxicillin-clavulanate) confers resistance to β -lactamases
- ✓ Clavulanic acid inactivates some beta-lactamase enzyme that are produced by bacteria ,therefore preventing enzymatic destruction of amoxicillin .this helps to treat variety of bacterial infections which good otherwise be resistant to antibiotics without the addition of clavulanic acid.

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