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Use of amoxycillin in pediatric dentistry and knowledge and attitude of practitioners toward developing resistance: a cross sectional questionnaire study

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Abstract---Antibiotics are prescribed to patients in dentistry to combat various infections and pain. Antibiotics cure disease by killing, injuring, or inhibiting the growth of bacteria at very low concentrations. Unwarranted use of antibiotics is reported in children, mostly for ear and dental infections. However, in children, this

insufficient knowledge of the appropriate clinical indications leads to increase in microbial resistance to antibiotics. A set of questionnaire was prepared based upon the antibiotics written by dentists. Total 95 dentist actively took part in the study. Questions were both open and close ended. Statistical analysis was done for the answers given. It was seen that there was a lack of knowledge among practitioners about the side effects and resistance of antibiotics. It concludes that better use of diagnostic services; surveillance and improvements in dental education are required now to lessen the impact of antibiotic resistance in the future. In the present study about 41% dentists prescribed amoxicillin to pediatric patients. Amoxicillin use is associated with developmental enamel defects. The duration of antibiotic treatment should be kept shortest. Most acute infections are resolved in 3-7 days. When oral antibiotics are used high dose should be considered to secure faster therapeutic levels. Long courses of antibiotics may increase the selection of resistant micro-organisms and resistance plasmid transfer by conjugation.

Keywords---antibiotics, amoxicillin, knowledge, attitude, resistance.

Introduction

Infection remains a major problem in dental practice, and their rational treatment with drugs is of prime importance. Antibiotics are prescribed to patients in dentistry to combat various infections and pain. Antibiotics cure disease by killing, injuring, or inhibiting the growth of bacteria at very low concentrations.¹ Therefore knowledge of antibiotics is very important in prescribing it in oral and dental diseases. Due to lack of knowledge among dentist there has been irrational prescribing of antibiotics for nonindicated clinical conditions, like pain relief, irreversible pulpitis, and localized dentoalveolar abscess.^{2, 3} Unwarranted use of antibiotics is reported in children,[3] mostly for ear and dental infections. However, in children, this insufficient knowledge of the appropriate clinical indications leads to increase in microbial resistance to antibiotics. It has become a well-documented and a serious global health concern.⁴ Children as young as 4 years were found to harbor multidrug-resistant bacteria in their oral cavities.^{5,6}

The most frequently prescribed antibiotic is penicillin or an analog, especially amoxicillin. However, other new-generation antibiotics are becoming more widely used due to the belief that these are more effective, and they are more expensive. This belief may be based more on marketing than on the fact, as their effectiveness has not been demonstrated in clinical trials.⁷ Clinical cases that are non-indicated for antibiotic use include acute periapical infection, dry socket, and pulpitis. Chronic inflammatory periodontal conditions are also not indicated for antibiotics; systemic antimicrobials should only be used in acute periodontal conditions where drainage or debridement is impossible, where there is local spread of the infection or where systemic upset has occurred. More common dental infections are in the form of pulpitis and periapical periodontitis. These require only operative measures like fillings, root canal therapy, or extraction if the tooth is not restorable. Unfortunately, dentists still prescribe antibiotics for

this condition.⁸ Even some prescribe antibiotics for viral infections. Therefore following study was done to analyze the knowledge of dentist regarding antibiotics prescription

Material

A set of questionnaire was prepared based upon the prescription and attitude of dentists towards antibiotics. Total 95 dentist actively took part in the study. Questions prepared were both open and close ended.

Methods

Statistical analysis was done for the answers given by practitioners using software SPSS 20.0. Data analysis is shown with the help of pie chart. The color covering the larger area shows measure of spread whether the data is tightly clustered or more spread out. Image 1 shows the common side effects of antibiotics in which hypersensitivity is covering the least area in pie chart whereas gastric irritation and nausea covers the majority of area. Image 2 shows antibiotic which is most commonly prescribed. With amoxicillin covering the largest area of all shows that it is the most commonly prescribed antibiotic.

Result

The study was based on the use of antibiotics in pediatric patients and awareness of practitioners towards its side effects. The responses showed that amoxicillin is the most prescribed antibiotics and the most preferred route to administer the antibiotic is oral route. It is the most accepted route by both patient and parents. As per the answers given by participants, gastric irritation and nausea are the common side effects that have been observed. It is observed that there is lack of knowledge regarding the new generation antibiotics and developing resistance. The Table 1 contain the questions prepared and the number of responses given with percentage.

Table 1: Survey questionnaire

1. Do you prescribe antibiotics to your pediatric patients?		
Yes	64	67.3%
No	31	32.6%
2. How do you calculate the dosage of particular antibiotics?		
Based on age	50	52.6%
Based on weight	32	33.6 %
Based on severity of disease	13	13.6%
3. Modes of administration?		
Oral route	43	45.2%
Intravenous	22	23.1%
Subcutaneous	16	16.8 %
Intra-arterial	14	14.7%
4. What are the common antibiotics you prescribe to your pediatric patients?		
Amoxicillin	39	41.0%
metronidazole	30	31.5%

Cephalexin	19	20%
Ampicillin	7	7.3%
5. Are you aware of side effects of amoxicillin?		
Yes	57	60%
No	38	40%
6. What are the common side effects of the antibiotics you prescribe?		
Gastric irritation	31	33.6%
Nausea	38	40%
Vomiting	10	10.5%
Headache, tinnitus, depression	8	8.4%
Rashes itching	4	4.2%
Hypersensitivity	4	4.2%
7. Duration of antibiotics?		
2-5 days	29	30.5%
5-7 days	27	28.4%
More than 7 days	39	41.0%
8. Are you aware of new generation of antibiotics?		
Yes	43	45.2%
No	52	54.7%
9. Do you do antibiotic sensitivity test?		
Yes	30	31.5%
No	65	68.4%

Table 2
Procedures requiring and not requiring Antibiotic Prophylaxis ¹

Dental procedures requiring antibiotic prophylaxis
Dental extractions
Periodontal procedures including surgery, scaling, root planing and probing
Dental implant placement, reimplantation of teeth
Endodontic instrumentation or surgery beyond the tooth apex
Subgingival placement of antibiotic fibers or strips
Initial placement of orthodontic bands but not brackets
Intra-ligamentary local anaesthetic injections

Table 3
Specific antibiotic regimen revised by the American Heart Association (AHA) in 2014¹

Regimen: Single Dose 30 to 60 min before procedure			
Situation	Agent	Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin or	2 g IM or IV	50 mg/kg IM or IV
	Cefazolin /Ceftriaxone	1 g IM or IV	50 mg/kg IM or IV
Allergic to Penicillins or Ampicillin - oral	Cephalexin Or	2g	50 mg/kg
	Clindamycin Or	600 mg	20 mg/kg
	Azithromycin/Clarithromycin	500 mg	15 mg/kg
Allergic to penicillin or Ampicillin and unable to take oral medication	Cefazolin /Ceftriaxone Or	1 g IM or IV	50 mg/kg IM or IV
	Clindamycin	600 mg IM or IV	20 mg/kg IM or IV

Statistical Analysis

Image 1

common side effects

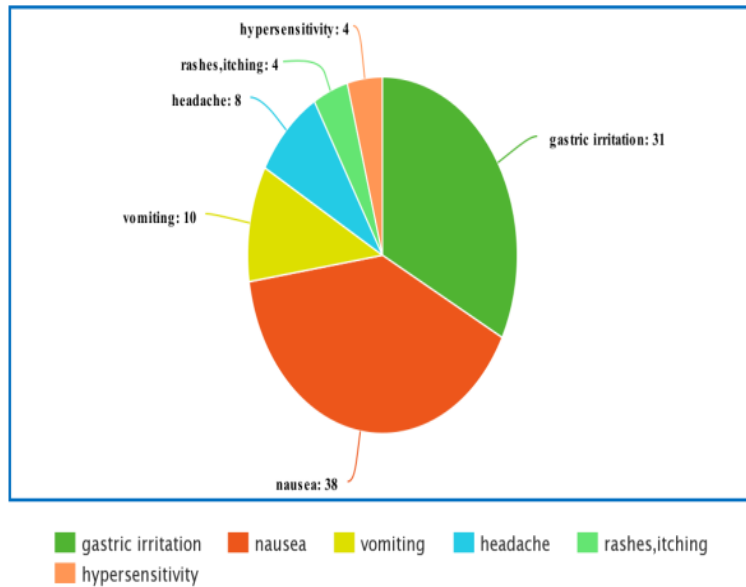
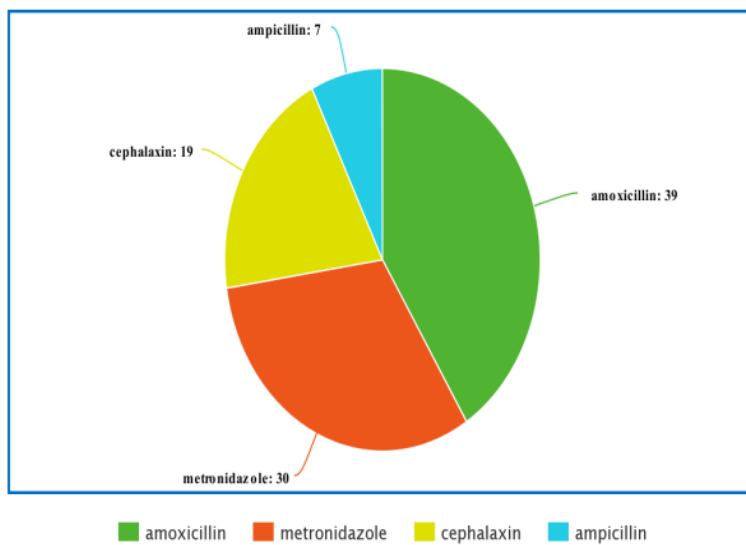


Image 2

commonly prescribed antibiotics



Discussion

Recently the prescription of antibiotics has become more complicated than before, because practitioners are dealing with microbial resistance to the prescribed

antibiotics. Most practitioners prescribe antibiotics to either delay the treatment or they do not guarantee the sterilization.

In the present study about 41% dentists prescribed amoxicillin to pediatric patients while rest prescribed metronidazole with 31% preference which in accordance to the study done by Najla S⁹ and Teoh L¹⁰ in which Amoxicillin was the most popular antibiotic (62.9%) to be prescribed by dentists treating children. A lesser percentage (29.7%) prescribes combination of antibiotics. Around 37% prescribe antibiotics for duration longer than 5 days similar to present study in which 61% prescribed antibiotics for more than 5 days. Erythromycin was the most popular alternative to amoxicillin (77.8%) followed by clindamycin (22.2%).⁹. Amoxicillin Clavulanic acid combination was introduced in 1984 to enhance the effectiveness of amoxicillin

Pediatric Dosage of amoxicillin: ¹

Children up to 10 years > 40 kgs - 125– 250 mg every 8 hours

Children up to 10 years < 40 kgs - 20 – 40 mg/kg daily in divided doses every 8 hours or 25 - 45 mg/kg daily in divided doses every 12 hours

Maximum dosage for Children: 2 g/day.

Infants < 3 months old - Maximum of 30 mg/kg daily in divided doses.

In present study around 41% dentists preferred time duration to be more than 7 days. Rest had equally distributed views on 2-5 days and 5-7 day which is similar to result stated by Inchara ⁷ in which more than 38% dentists prescribed antibiotics for more than 7 days. Oral antibiotics that are effective against odontogenic infection comprises of penicillin, clindamycin, erythromycin, cefadroxil, metronidazole, and tetracyclines. The duration of antibiotic treatment should be kept shortest. It should be such that it is capable of preventing both clinical and microbiological relapse. Most acute infections are resolved in 3-7 days. When oral antibiotics are used high dose should be considered to secure faster therapeutic levels¹¹ In present study 50 (52%) practitioners considered child's age for prescribing medicine similar to study done by Ramadan¹² and smaller portion considered weight of child (33%). Prescribing antibiotics as analgesics were shown to be one of the forms of antibiotic overuse in a study. Similar observations were made by Abdulrahman¹³ in which dental students prescribe antibiotics inappropriately to manage various conditions when not indicated. With each antibiotic usage there is a possibility of:

- sensitizing the patient to the drug
- hypersensitivity reaction
- toxic reaction
- the development of stains of microbes resistant to the drug
- superinfection by other organisms. ¹⁴

If a true allergic reaction occurred, one or more of the classic signs or symptoms of allergy should have been evident such as urticaria, swelling, skin rash, chest tightness, dyspnea, shortness of breath, rhinorrhea, and conjunctivitis. Around 40% patients reported nausea and 33% reported gastric irritation in this study also only 31% of dentists performed antibiotic sensitivity test. There is a trend

toward an increase of late response to penicillins nowadays due to the increased consumption of amoxicillin. Therefore delayed readings of skin tests can be highly informative.¹⁵

Immunodepressed children should be given antibiotic support at the first sign of oral infection. The degree of trauma decides antibiotic coverage for traumatic dental procedures. The degree of immunodepression, and the child's general systemic condition are also the additional factor.¹⁴ It has been suggested that amoxicillin use is associated with developmental enamel defects. Hong¹⁶ the results show that amoxicillin used in infants below 32 months age seems to be linked to dental fluorosis on both permanent I molars and maxillary central incisors. Duration of amoxicillin use was related to the number of early erupting permanent teeth with fluorosis. Even after controlling for other potential risk factors, such as fluoride intake, otitis media infections, and breastfeeding in early infancy there was significant association between amoxicillin usage and dental fluorosis. This is in contradiction to the study done by Ciarrocchi¹⁷ in which no evidence of association was detected.

Antibiotic treatment is essential to treat septicaemia. It acts by killing dividing bacteria in the blood stream. Clinical signs of pyrexia, trismus, significant regional lymphadenopathy, gross facial swelling, closure of the eye, dysphagia, tachycardia and rigors are considered as indicators of systemic response to infection and adjunctive antibiotic therapy is always indicated.¹⁸ It has now been proved that long courses of antibiotics are not required and it may destroy the homeostasis of the oral micro-flora and lead to colonisation resistance.¹⁹ In addition, long courses of antibiotics may increase the selection of resistant micro-organisms and resistance plasmid transfer by conjugation. Studies reveal that many oral microbes such as *Streptococcus* spp., *Prevotella* spp., *Fusobacteria* spp., *Haemophilus* spp., *Veillonella* spp., *Porphyromonas gingivalis*, *Aggregatibacter actinomycetem comitans*, and *Actinomyces* have attained resistance to multitudinal antibiotics.²⁰ The diagnostic microbiology laboratory has a significant role to play in surveillance. With the help of these tools it will be easier to identify organisms with a pathogenic role in infection, and their susceptibility testing can be done. Local surveillance networks are most important for guiding clinicians in the use of empirical therapy and managing resistant infections. It concludes that better use of diagnostic services, surveillance and improvements in dental education are required now to lessen the impact of antibiotic resistance in the future.

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