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ORIGINAL ARTICLE

Common Microorganisms and Drug Sensitivity in Odontogenic Infection

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ABSTRACT

Objective: To determine the frequency of causative microorganisms and drug sensitivity in odontogenic infection.

Methodology: This cross-sectional study was done at the department of Oral and maxillofacial surgery of Liaquat University Hospital Hyderabad, during six months from August 2018 to January 2019). All subjects of 12 to 50 years of age, either gender with odontogenic infections were included. Pus was collected by transport media/swab stick and sent to the Hospital diagnostic laboratory for culture and antibiotic susceptibility, while the antibiotic sensitivity test for the isolates was performed, whereas the data was collected on pre-designed proforma and analyzed by SPSS version 26.

Results: A total of 200 patients with odontogenic infection of either gender were studied. Mean age of these cases was 51.94±8.93 years and males were in majority 63.5%. The causative microorganism includes Staphylococcus species 24.5%, Streptococcus 22.0%, Pseudomonas aeruginosa 16.0%, eubacterium 13.5%, Porphyromonas 10.5%, Prevotella 6.5%, and Fusobacterium 7.0%, while drug sensitivity includes Ampicillin 33.5%, amikacin 24.5%, Gentamicin 17.0%, Cefotaxime 14.5% and ceftazidime 10.5%. Frequency of causative microorganisms was statistically significant according to gender ($p < 0.05$), while insignificant according to age (P->0.05).

Conclusion: As per study conclusion the staphylococcus species, streptococcus, Pseudomonas aeruginosa, eubacterium, Porphyromonas Prevotella and fusobacterium were observed to be the causative organisms in odontogenic infection. Ampicillin was the highly sensitive antibiotic drug followed by amikacin, gentamicin, cefotaxime and ceftazidime. Odontogenic infection cultures are necessary to isolate all pathogens and for successful management.

Key words: Odontogenic infections, Microorganism, antibiotic sensitivity

INTRODUCTION

Dental infection has plagued humanity for as long as civilization has existed, and studies show that odontogenic infections, which are caused by dental caries, periodontitis, pericoronitis, dentition trauma and supporting structures, or complications after several dental treatment procedures, account for most pyogenic orofacial infections.[1,2] The majority of these infections are polymicrobial in nature, while the most prevalent bacteria recovered in odontogenic infection are Streptococcus (36.4%), Peptostreptococcus (58.9%), Pseudomonas Aeruginosa(18%), Prevotella, Porphyromonas, Eubacterium and Fusobacterium species; Staphylococcus aureus, which accounts for 9.1% of the population, has lately emerged as the oral pathogen demonstrated by the several studies.[3-5] Pyogenic odontogenic infection is most typically connected with the 2nd and 3rd permanent molars.[6] Moreover, the anatomic placement of the teeth in question may influence the fascial areas into which the infection spreads.[7] Although a recent study found the submandibular space to be among the most common site for pyogenic odontogenic infection, other researchers have discovered that various fascial spaces are more common.[8] In all infections, about 7 to 12 percent of antibiotic prescriptions are for odontogenic infections, with a reported incidence of 43.3 percent for culture and sensitivity.[9,10] Although laboratory data on bacteriology and microbial susceptibility are important for clinicians contemplating antimicrobial therapy, most prescriptions are based on guesswork and do not include routine culture and sensitivity tests. Unfortunately, the widespread use of broad-spectrum antibiotics has reduced the susceptibility of oral bacteria, resulting in an increase in resistant strains.[11] The emergence of antibiotic resistance has a significant impact on the antimicrobial drugs used in empirical therapy. Phillips et al. found major variances in resistance patterns connected to individual hospitals, geographic locations, and antibiotic prescribing regimens in a bacterial susceptibility investigation.[12] Different studies have shown different frequencies of microorganisms and antibiotic sensitivity. Hence, this stud aimed to identify the common causative organisms and drug sensitivity of odontogenic infection in our population to make appropriate strategy to prevent infection accordingly. In this way, early and correct diagnosis was provided supportive care and prevent to acquire life threatening complications due to infections, and it also prevents drug resistance in our society for community used empirical antibiotics.

MATERIAL AND METHODS

This cross-sectional study was conducted at the Department of Oral and maxillofacial surgery of Liaquat University Hospital Hyderabad. The study duration was Six

months (from August 2018 to January 2019). Non-probability consecutive sampling technique was used. All patients aged between 12 years to 50 years having odontogenic infections assessed by general and oral examination and of either gender were included. All patients who are unwilling to participate in the study, patients already on any antibiotic treatment and pregnant females were excluded. Informed and written consent was taken from patients. Following all aseptic procedures, including irrigation with 0.2% chlorhexidine intra orally and skin cleaned with povidine 5% solution. Pus was collected by transport media/swab stick and sent to Diagnostic and Research laboratory Hyderabad for culture and antibiotic susceptibility. After collected pus sample inoculation is done on Agar plate and then incubated at 37°C for 24to 48 hours for aerobic culture and for anaerobic culture media kept anaerobic condition at 37˚Cfor 72 hours. Then after reading of inoculate medium if growth occurs then further procedure was done. The isolates were tested for antibiotic sensitivity in Muller Hilton agar using Kirby–Bauer's disc diffusion method. According to the Kirby–Bauer method, the zone of inhibition was assessed and recoded as sensitive, intermediate sensitive, and resistant. The antibiotic discs were obtained from Hi- Media and all information was gathered in predesigned proforma. Data was analyzed on SPSS program version 26.

RESULTS

During a six-month study period, 200 patients with odontogenic infection were recruited and studied. The mean age was 51.94±8.93 years. The male population was predominant (63.5%). The common causative microorganisms of odontogenic infection were staphylococcus species 24.5%, streptococcus 22.0%, pseudomonas aeruginosa 16.0%, Eubacterium 13.5%, Porphyromonas 10.5%, Fusobacterium 7.0% and Prevotella 6.5%, while the drug sensitivity observed as ampicillin 33.5%, amikacin 24.5% and gentamicin 17.0% presented. Table.1. Statistical non-significance was observed for causative microorganisms in accordance with age (p=0.98) while significance in accordance with gender (p=0.03). Table 2 & 3

Table.1 Descriptive statistics of age, gender, causative organisms and sensitive drugs n=200

Variables		Statistics
Age		51.94±8.93 years
Gender	Males	127 (63.5%)
	Females	73(36.5%)
Causative Organism	Staphylococcus species	49(24.5%)
	Streptococcus	44(22.0%)
	Pseudomonas aeruginosa	32(16.0%)
	Eubacterium	27(13.5%)
	Porphyromonas	21(10.5%)
	Prevotella	13(6.5%)
	Fusobacterium	14(7.0%)
Antibiotic sensitivity	Ampicillin	67(33.5%)
	Amikacin	49(24.5%)
	Gentamicin	34(17.0%)
	Cefotaxime	29(14.5%)
	Ceftazidime	21(10.5%)

Table 02: The causative organisms in accordance to age n=200

Causative organisms	AGE (years)				p-value
	12-19	20-29	30-39	40-50	
Staphylococcus species	9	14	9	17	0.98
Streptococcus	12	17	7	8	
Pseudomonasaeruginosa	5	12	5	10	
Eubacterium	5	8	5	9	
Porphyromonas	4	6	5	6	
Prevotella	3	3	2	5	
Fusobacterium	4	3	3	4	
Total	42	63	36	59	

Table 03: The causative organisms in accordance to gender n=200

Causative organisms	GENDER		p-value
	Male	Female	
Staphylococcus species	40	9	0.03
Streptococcus	21	23	
Pseudomonas aeruginosa	22	10	
Eubacterium	17	10	
Porphyromonas	11	10	
Prevotella	7	6	
Fusobacterium	9	5	
Total	127	73	

DISCUSSION

The most prevalent orofacial infections are odontogenic infections, which can spread into nearby anatomical spaces across contiguous fascial planes, resulting in numerous places being involved, which can lead to life-threatening conditions.[13] In this study, mean age was 51.94 ± 8.93 years ranged from 12 to 50 years and males were in majority. Consistently Böttger S et al[14] demonstrated that out of all study cases, 68% were males and 32% cases were females with an average age of 47.42 years. Alternatively, Plum AW et al[15] reported that the males were 50.4% and females were 49.6%, while the mean age was lower compared to our study 35.1 years. Differences in average age may be because of differences in age ranges and selection criteria. In this study, of the 200 isolates, Staphylococcus species 49(24.5%), Streptococcus 44 (22.0%), Pseudomonas aeruginosa 32 (16.0%), Eubacterium 27 (13.5%), Porphyromonas 21 (10.5%), Prevotella 13 (6.5%) and Fusobacterium 14 (7.0%). Although in the study of Plum, AW et al[15] reported that the commonest organisms were seen Prevotella spp., Staphylococcus spp., and Streptococcus spp. (alpha hemolytic and milleri). Alpha hemolytic, milleri, and beta hemolytic streptococcal strains were the three most prevalent forms of streptococcal strains. On other hand in the study of Reddy PA et al[15] reported that the most prevalent organisms were Staphylococcus aureus (47.5%), 42.5% Streptococcus viridans and the 10% Enterococcus. In 19 of the individuals, Staphylococcus aureus was the most often isolated bacteria. Firmicutes were reported at a maximum of 36.7 percent, Bacteroidetes at 17.1 percent, Proteobacteria at 17.1 percent, Actinobacteria at 11.6 percent, Spirochaetes at 7.9 percent, and Fusobacteria at 5.2 percent of streptococcal strains were beta hemolytic, milleri and alpha hemolytic, according to Verma et al[17]. However, in the study of Shakya, N et al[13] found comparable findings regarding causative organisms. The bacterial strains obtained in this study were mostly sensitive to ampicillin 67(33.5%), amikacin 49 (24.5%),

gentamicin 34 (17.0%), cefotaxime 29 (14.5%) and ceftazidime 21(10.5%). Although Shakya N et al[13] demonstrated that the Penicillin has excellent action against aerobic isolates (97.05 percent). Clindamycin had great overall action against aerobic isolates (99.01 percent). Cefotaxime has a high level of activity (91.18 percent) against aerobic isolates. All the aerobic isolates were resistant to amoxicillin/clavulanic acid (100 percent). Ciprofloxacin has high antibacterial efficacy against aerobes, and S. aureus was the only bacterium that showed significant resistance to it. Brescó-Salinas M et al[18] reported that gram-positive, fermentative cocci were the most common isolates (Enterococcus faecalis and Streptococcus mutans and oralis). Streptococcus colonized the lower third molar pericoronitis the most commonly (54.4%), whereas Enterococcus was linked with the periapical lesions (19.2%), and the strains were found to be frequently sensitive with the most frequently used antibiotics (amoxicillin only and amoxicillin / clavulanate), as well as linezolid. Tancawan et al[19] found that Amoxicillin/clavulanic acid had equivalent efficacy and tolerability to clindamycin in terms of attaining clinical effectiveness in the management of odontogenic infections. Clinically and legally, a pragmatically logical approach to antimicrobial therapy choosing is permissible if the decision is based on specific evidence and actual experience with oral microbiology.[20] Most odontogenic infections, which are becoming more common, are still treated with penicillin; however, If the pathogen does not respond to the starting antibiotic, there must be a strong probability that a resistant bacterium is present.[20] Although penicillin resistance is rising, Amoxycillin/Clavulanic acid or Metronidazole may be used as an alternate antibiotic in an emergency, according to Dahlen G, et al[21]. Metronidazole is the medicine of choice if the individuals are allergic to penicillin. In most research, it has been established that all anaerobic strains are responsive to Metronidazole, and there is a significant probability that the involvement of a resistant pathogen.[22,23] Surgical drainage and the necessity for final replacement or extraction of diseased teeth, which are the primary source of infection, are the most essential therapeutic options for pyogenic orofacial infections.[24] Heat therapy in the form of moist packs and/or mouth rinses is also indicated as a supportive therapy in the treatment of orofacial infections. Heat causes vasodilation and enhanced circulation, as well as the elimination of tissue breakdown products more quickly and a large influx of defense cells and antibodies, zolet have a high probability of encountering a resistant organism.[1]

CONCLUSION

As per study conclusion the staphylococcus species, streptococcus, pseudomonas aeruginosa, eubacterium, Porphyromonas Prevotella and fusobacterium were observed to be the causative organisms in odontogenic infection. Ampicillin was the highly sensitive antibiotic drug followed by amikacin, gentamicin, cefotaxime and ceftazidime. Consequently, successful care of odontogenic infections is primarily reliant on decompression, removal of the etiologic component, and the selection of the appropriate antibiotic. More studies are needed to review the introduction of newer antibiotics and their changing sensitivity to different isolates.

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