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KNOWLEDGE OF ANTIMICROBIAL RESISTANCE AND ANTIMICROBIAL PRESCRIPTION AMONG DENTAL PRACTITIONERS IN CHENNAI CITY- A CROSS-SECTIONAL STUDY

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ABSTRACT: Introduction: Most human oro-facial infections originate from odontogenic infections, and prescribing antimicrobial has become a ubiquitous phenomenon. The World Health Organization (WHO) has recognized the inappropriate, indiscriminate and irrational use of antimicrobials leading to antimicrobial resistance. **Aim & Objective:** To assess the knowledge of antimicrobial resistance and antimicrobial prescription among dental practitioners in Chennai city. **Materials and Methods:** A total of 110 registered dental practitioners participated in this cross-sectional study. A pre-validated and self-administered questionnaire was prepared and distributed to the registered dental practitioners in Chennai city to collect the demographic details and the information regarding knowledge and practice towards antimicrobial resistance and an antimicrobial prescription for the most common oral conditions and commonly prescribed antimicrobials for their patients were obtained. Statistical analysis. The data were statistically analyzed by using the Statistical Package for the Social Science version 20.0. Descriptive statistics were performed, and a Chi-square test was done to assess the association between knowledge and practice of BDS and MDS participants. **Results:** 79.66% of BDS and 92.16% of MDS practitioners recommended amoxicillin as their first choice antibiotic drug. 77.96% of BDS and 52.94% of MDS were used to calculate the drug dosage based on the age and weight of the patients. During the pregnancy period, 76.27% of BDS and 60.78% of MDS practitioners were considered, amoxicillin is the safest antibiotic for oral infections. **Conclusion:** Based on this cross-sectional survey, the overall knowledge of antimicrobial prescription and antimicrobial resistance among dental practitioners was lower.

INTRODUCTION: Throughout our history, the discovery of antimicrobial drugs has been a boon to us. Antimicrobial drugs can be called “Life-saving drugs”. However, the antimicrobial prescription may be associated with unfavorable side effects ranging from gastrointestinal disturbances to fatal anaphylactic shock.

Additionally, inappropriate, indiscriminate, and irrational use of antimicrobials has led to antimicrobial resistance ^{1, 2}. This growing problem has contributed significantly to the morbidity and mortality of infectious diseases, with death rates of communicable illnesses rising again ^{3, 4}.

The World Health Organization has recognized this growing global problem announcing their theme for the year 2011 as “Antibiotic resistance: No action today, no cure tomorrow” and has pressed for an international action ⁵. India is one of the largest consumers of antimicrobial drugs worldwide. Overall, 80% of physicians and 7-11% of dentists prescribe antimicrobial drugs. Although judicious

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use of antimicrobial agents is strongly encouraged, their overuse or misuse has become entrenched globally in various settings. In acute care hospitals, it is estimated that approximately 20%–50% of all antimicrobials prescribed are either unnecessary or inappropriately used. Some of the factors influencing this irrational prescription use include socio-economic status, physician and dentist's knowledge, and training, patient load, diagnostic ambiguity, availability of treatment guidelines and pharmaceutical marketing⁵.

Further rampant antimicrobial use has contributed to adverse clinical outcomes, increasing healthcare costs, and the emergence of multidrug-resistant organisms, which poses a significant threat to public health. The dentistry-based antimicrobial prescription has emerged as a major potential driver of the global phenomenon of antimicrobial resistance. Approximately 2.4 million people get antimicrobial resistance infection which accounts for 50000 deaths/year (World Health Organization, 2019)⁶.

The basic step that can be taken towards building up antimicrobial resistance could be awareness. This also includes knowledge about the right drug to be prescribed at the right time with the appropriate dosage. Many approaches are being made to control the spread. One of these approaches is to undertake various institutional and educational programs among the public and medical sectors about antimicrobial resistance and its complications regarding the steps that can prevent its development and spread. The Indian Council of Medical Research has initiated an antimicrobial stewardship program that aims to restrict inappropriate use of antimicrobials, optimize selection, dose, route, and duration of the treatment for best outcomes, minimizing detrimental adverse events, high costs and the emergence of resistance⁷.

The World Health Assembly adopted a global action plan on antimicrobial resistance, which gives five specific objectives (WHO global action plan for AMR 2015). These objectives underscore the need for an effective "one health" approach involving coordination among numerous international sectors. Literature evidence shows that dentists are prescribing more common

antimicrobial drugs for many dental diseases. Exploration of the same revealed very limited studies in India assessing the antimicrobial prescription pattern among dentists. As per the National Center for Disease Control and Prevention, approximately one-third of all outpatient antimicrobial prescriptions are unnecessary. According to The Indian Council of Medical Research (2017), antimicrobial overprescribing is common in dentistry and major contributor to antimicrobial resistance⁸. Also, the lack of awareness observed emphasizes the need for developing national guidelines for antimicrobial use in dental conditions. Practicing such guidelines will go a long way in controlling antimicrobial resistance. Hence, this study was conducted to assess the dental practitioner's knowledge and practice regarding antimicrobial prescription and resistance in Chennai city.

MATERIALS AND METHODS: This cross-sectional study was approved by the Institutional Review Board of Ragas Dental College and Hospital (IEC Number-20191207). A pre-validated and self-administered questionnaire was prepared and distributed to the registered dental practitioners in Chennai city to collect the demographic details regarding age, gender, designation, year of clinical experience, type of dental practice with the information regarding knowledge and practice towards antimicrobial resistance and an antimicrobial prescription for the most common oral conditions and commonly prescribed antimicrobials for their patients were obtained.

The questionnaire contained both close-ended and open-ended questions to make it flexible for the participants. This questionnaire contains 14 knowledge questions and 10 attitude questions. Written informed consent was obtained from all the study participants. A total of 110 registered dental practitioners participated in this cross-sectional study.

Sample Size Calculation: Sample size calculation was performed according to a study conducted by Puranik *et al.*, (2018)⁹ considering a study with an 80% power and $\alpha = 0.05$. The minimum sample size should be 96 individuals using G-Power software version 3.1.

Inclusion and Exclusion Criteria: Dentists who were registered in the Dental Council of India and had more than one year of clinical experience were included in this study. Dental students and non-registered dental practitioners were excluded. Participants who failed to return filled-in forms within the data collection period were excluded from this study.

Statistical Analysis: The data were entered into Microsoft Excel 2010 version and the statistical analyzed by using the Statistical Package for the Social Science version 20.0 (IBM Corp, Armonk, New York, United States).

Descriptive statistics were performed and a Chi-square test was done to assess the association between knowledge and practice of BDS and MDS participants. For analysis, responses regarding knowledge and practice were dichotomized as correct and incorrect. $P < 0.05$ (confidence interval of 95%) was considered as statistically significant.

RESULTS: In this cross-sectional study, a total number of 110 registered dental practitioners participated, of which 71 (64.6%) were males, and 39 (35.4%) were females with a mean age of 31.0 ± 2 years.

The majority of participants were qualified as BDS (53.64%), and others were MDS (46.36 %). Out of 110 registered dental practitioners, 59 (53.64%) were doing clinical practice individually and 51

(46.36%) practitioners were doing group practice. Most of them had working experience of up to 5 years **Table 1**.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS AND WORK EXPERIENCE OF STUDY PARTICIPANTS

Demographic characters	N (%)
Age (years)	
≤ 30	62 (56.36%)
> 30	48 (43.63%)
Gender	
Male	71 (64.6%)
Female	39 (35.4%)
Qualification	
BDS	59 (53.64%)
MDS	51 (46.36 %)
Work experience (years)	
< 5	65 (59.09%)
5-10	41 (37.27%)
> 10	04 (3.63%)
Type of dental practice	
Group practice	51 (46.36%)
Individual practice	59 (53.64%)

Table 2 denotes common antibiotics, and antibiotic courses prescribed by dental practitioners: BDS (79.66%) and MDS (92.16 MDS) practitioners recommended amoxicillin as their first choice antibiotic drug, followed by the combination of amoxicillin with clavulanic acid (20.34% BDS and 3.92% MDS). Antimicrobial prescriptions of 42.37% of BDS and 45.09% of MDS practitioners were prescribed for 3 days and 45.76 percent of BDS and 49.01 percent of MDS practitioners were prescribed antimicrobials for 5 days.

TABLE 2: COMMON ANTIBIOTIC & DURATION OF ANTIBIOTIC COURSE

Common antibiotic & duration of antibiotic course	BDS (59)	MDS (51)	P value
Commonly prescribed antibiotic			.014
Amoxicillin	47 (79.66%)	47 (92.16%)	
Amoxicillin-clavolinic acid	12 (20.34%)	02 (3.92%)	
Other antibiotics	0 (0%)	02(3.92%)	
Duration of antibiotic course			.337
3 days	25 (42.37%)	23 (45.09%)	
5 days	27 (45.76%)	25 (49.01)	
7-10 days	07 (11.86%)	03 (5.88%)	

Table 3 denotes the knowledge about antimicrobial prescriptions of dental practitioners, most of the dental practitioners (77.96% BDS and 52.94% MDS) were used to calculate the drug dosage based on the age and weight of their patients. So, the difference between BDS and MDS dental practitioners was statistically significant ($P=0.005$). The undergraduate (81.36 %) and postgraduate (60.78%) dental practitioners were given antibiotic

prophylaxis for dental procedures like flap surgery, Dental implant placement & reimplantation of teeth, Endodontic instrumentation, or surgery beyond the tooth apex. But the conditions like the shedding of deciduous teeth, bleeding from trauma to the lips, or oral mucosa for these two dental conditions both the group of dental practitioners (BDS-67.80% and MDS-37.25%) were not prescribed antibiotic prophylaxis before the

treatment was statistically significant (P=0.005). Following cardiac conditions like Infective endocarditis and compromised immunity, patients with shunts, indwelling vascular catheters & medical devices, and patients with prosthetic joints, both the group of dental practitioners (BDS-

59.32% and MDS-43.14%) gave antibiotic prophylaxis before any dental procedures. 76.27% of BDS and 60.78% of MDS practitioners were considered during the pregnancy period; amoxicillin is the safest antibiotic for oral infections **Table 3**.

TABLE 3: KNOWLEDGE ABOUT ANTIMICROBIAL PRESCRIPTION

Q. no.	Question	Options	BDS	MDS	P
1	An adult patient has severe dental abscess with systemic involvement in this condition what would be your 1st line antibiotic drugs?	A-Amoxicillin B-Penicillin V C- Metronidazole D- all the above	19 (32.20%) 05 (8.47%) 10 (16.9%) 25 (42.37%)	24 (47.06%) 04 (7.84%) 04 (7.84%) 19 (37.25%)	0.318
2	The patient has a severe dental abscess and allergic to the penicillin group of drugs, what would be your alternative 1st line antibiotic drug?	A-Penicillin V B-Metronidazole C-Amoxi-clav D-Clindamycin	02 (3.39%) 20 (33.90%) 03 (5.08%) 34 (57.63%)	11 (21.57%) 20 (39.22%) 04 (7.84%) 16 (31.37%)	0.006
3	A patient with severe dental infection & did not respond to 1st line antibiotic drugs. What would be your next step?	A-Check the diagnosis & Refer the patient to a specialist before go to 2 nd line antibiotic B-Repeat the same course of 1 st line antibiotic with increased dosage C-Do culture sensitivity test D-Directly go to 2 nd antibiotic.	23(38.90%) 02 (3.38%) 27 (45.76%) 07 (11.86%)	24 (47.06%) 06 (11.77%) 18 (35.29%) 03 (5.88%)	0.182
4	For the patient who does not respond to 1st line antibiotics and suffers from severe diarrheal condition what would be your drug of choice?	A-Clindamycin B-Higher dose Amoxicillin C-Amox-clav D-All of the above	32 (54.23%) 04 (6.77%) 17 (28.81%) 06 (10.17%)	27 (52.94%) 07 (13.73%) 13 (25.49%) 04 (7.84%)	0.659
5	An immune-suppressed adult patient has necrotizing ulcerative gingivitis, in this condition which drug would you prescribe?	A-Metronidazole B-Amoxicillin C-Metronidazole & Amoxicillin	12(20.34%) 04 (6.78%) 43 (72.88%)	16 (31.37%) 06 (11.76%) 29 (56.86%)	0.209
6	What is your drug of choice is a Pericoronitis infection with persistent swelling or systemic symptoms despite local measures?	A-Amoxicillin- 500mg B-Amoxicillin-250mg & Metronidazole 200mg C-Metronidazole- 400mg & Amoxicillin- 500mg D-Metronidazole- 200mg & Amoxicillin- 500mg	08 (13.56%) 02 (3.39%) 40 (67.79%) 9(15.25%)	12 (23.53%) 07 (13.73%) 28 (54.90%) 4(7.84%)	0.070
7	In which of the following cardiac conditions Antibiotic prophylaxis is need before dental procedures?	A-Patients with Infective endocarditis and compromised immunity B-Patients with shunts, indwelling vascular catheters & medical devices C-Patients with prosthetic joints D- All the above	21 (35.59%) 03 (5.08%) 0 (0%) 35 (59.32%)	22 (43.14%) 07 (13.73%) 0 (0%) 22 (43.14%)	0.133
8	Which of the following antibiotics are safe during the pregnancy period?	A-Amoxicillin B-Clarithromycin C- Doxycycline D- Tetracycline	45 (76.27%) 08 (13.56%) 05 (8.48%) 01 (1.69%)	31 (60.78%) 13 (25.49%) 05 (9.90%) 02 (3.92%)	0.316
9	Antibiotic prophylaxis is not required before dental procedures	A-Shedding of deciduous teeth	14 (23.73%) 02 (3.39%)	18 (35.29%) 10 (19.60%)	0.005

		B-Bleeding from trauma to the lips or oral mucosa	40 (67.80%)	19 (37.25%)	
		C-A and B	03 (5.08%)	04 (7.84%)	
		D-Tooth extraction			
10	Antibiotic prophylaxis is required before dental procedures	A-Periodontal procedures including flap surgery	07 (11.86%)	09 (17.65%)	0.082
		B-Dental implant placement, reimplantation of teeth	03 (5.08%)	09 (17.65%)	
		C-Endodontic instrumentation or surgery beyond the tooth apex	01 (1.70%)	02 (3.92%)	
		D- All of the above	48 (81.36%)	31 (60.78%)	
11	Asthmatic patient with a severe dental abscess, under theophylline medication, Then which drug you should be avoided?	A-Amoxicillin	08 (13.56%)	15 (29.41%)	0.200
		B-Clarithromycin	25 (42.37%)	15 (29.41%)	
		C-Metronidazole	18 (30.51%)	14 (27.45%)	
		D- Amoxi-clav	08 (13.56%)	07 (13.72%)	
12	The cardiac patient with oral candidiasis infection, under warfarin medication then which of the following antifungal drugs you should avoid?	A-Fluconazole & Miconazole	19 (32.20%)	27 (52.94%)	0.019
		B-Clotrimazole & Amphotericin B	27 (45.76%)	21 (41.17%)	
		C-Ketoconazole	11 (18.64%)	01 (1.96%)	
		D-Amoxicillin	02 (3.39%)	02 (3.92%)	
13	Viral infection in Oro-facial region drug of choice	A-Acyclovir	47 (79.66%)	33 (64.71%)	0.024
		B-Fluconazole	01 (1.70%)	08 (15.68%)	
		C-Amoxicillin	07 (11.86%)	09 (17.65%)	
		D- Clindamycin	04 (6.78%)	01 (1.96%)	
14	How do you calculate the drug dosage?	A-Based on age	02 (3.39%)	13 (25.49%)	0.005
		B-Based on weight	07 (11.86%)	06 (11.76%)	
		C- Based on the infection rate	04 (6.78%)	05 (9.80%)	
		D- A and B	46 (77.96%)	27 (52.94%)	

For viral infections in the Oro-facial region, both BDS (79.66%) and MDS (64.71%), dental practitioners preferred Acyclovir as the drug of choice, and the difference between BDS and MDS dental practitioners were statistically significant ($P=0.024$). Pericoronitis infection both BDS (67.79%) and MDS (54.90%) dental practitioners were prescribed metronidazole - 400mg & Amoxicillin - 500mg. The severe dental infections did not respond to 1st line antibiotic drugs in this situation, 38.90% of BDS and 47.06% of MDS dental practitioners checked the diagnosis & refer the patient to the specialist before go to higher antibiotics, but 45.76% of BDS & 35.29% of MDS dental practitioners were going for the culture sensitivity test. The patients had a severe dental abscess, and who had allergic to the penicillin group of drugs in this condition BDS (57.63%) and MDS (31.37%) dental practitioners were prescribed alternative drug Clindamycin, but 33.90% of BDS and 39.22% of MDS dental practitioners were preferred metronidazole. The difference between both BDS and MDS groups was statistically significant ($P=0.006$) **Table 3**.

Table 4 denotes practice about antimicrobial prescriptions of dental practitioners, the undergraduate (35.59%) and postgraduate (62.75%) dental practitioners told that culture-sensitivity test was necessary for all the oral infections before prescribing antimicrobial drugs, but 54.24 % of BDS and 56.86 % of MDS participants were told that culture sensitivity test was not necessary for all the oral infections. The BDS and MDS dental practitioners prescribed systemic antimicrobials for common dental conditions like tooth sensitivity ($P=0.00$), Dento-alveolar abscess ($P=0.009$), tooth fracture ($P=0.029$), and halitosis ($P=0.003$) were statistically significant. Apart from that, the following dental conditions like dental caries, aphthous ulcers, gingival bleeding, and surgical removal of the impacted tooth were not statistically significant ($P=\geq 0.05$). Periodontal conditions like Periodontal pockets, Gingival abscess, Pericoronitis, ANUG, Endo-perio lesion, Generalized periodontitis, Gingivitis, Flap surgery, Aggressive periodontitis, Implant placement, Root planing, Operculectomy. There was no statistically significant difference between BDS and MDS

($P \geq 0.05$), but Periodontal abscess ($P=0.001$) was statistically significant. Both groups of dental practitioners had prescribed systemic antimicrobials for periapical pathological conditions like acute periapical abscess with no signs of fever, Periapical abscess with fever, Periapical pathology

progressed into cellulitis, discharge from endodontically treated teeth, avulsion and replantation was not statistically significant ($P \geq 0.05$). Asymptomatic chronic periapical pathology was statistically significant ($P=0.049$)

Table 4.

TABLE 4: PRACTICE OF ANTIMICROBIAL PRESCRIPTIONS

Q. no.	Question	Options	BDS %	MDS %	P
1	Alcoholic patient with necrotizing ulcerative gingivitis under warfarin medication would you prescribe metronidazole?	A-Yes B- No C- Don't know	08 (13.56%) 30 (50.85%) 21 (35.59%)	16 (31.37%) 26 (50.98%) 09 (17.65%)	0.026
2	For an Immune compromised patient with pseudomembranous candidiasis, would you prescribe fluconazole?	A-Yes B-No C- Don't know	42 (71.19%) 07 (11.86%) 10 (16.95%)	38 (74.51%) 02 (3.92%) 11 (21.57%)	0.444
3	If the Pediatric patient suffering from severe spreading dental infection, would you double the dosage of the antimicrobial drug?	A-Yes B-No C- Don't know	17 (28.81%) 34 (57.62%) 08 (13.56%)	26 (50.98%) 20 (39.22%) 05 (9.80%)	0.059
4	It is Necessary to do a culture-sensitivity test for all the oral infections	A-Yes B-No C- Don't know	21 (35.59%) 32 (54.24%) 06 (10.17%)	22 (62.75%) 29 (56.86%) 0 (0%)	0.132
5	Dental pain, which is relieved by drinking ice water would you prescribe antibiotics?	A-Yes B-No C- Don't know	13 (22.03%) 40 (67.79%) 06 (10.17%)	17 (33.33%) 27 (52.94%) 07 (13.73%)	0.277
6	Following Dental conditions need an antimicrobial prescription	A-Tooth sensitivity B-Halitosis C-Tooth fracture D-Dental caries E-Malocclusion F-Dental Fluorosis G-Apthous ulcers H-Discolored tooth I-Gingival bleeding J-Dentoalveolar abscess K-Surgical removal of impacted tooth	01 (1.70%) 02 (3.40%) 05 (8.48%) 05 (8.48%) 0 (0%) 0 (0%) 04 (6.78%) 0 (0%) 09 (15.25%) 54 (91.53%) 37(62.71%)	13 (25.49%) 11 (21.57%) 12 (23.53%) 10 (19.61%) 05 (9.80%) 04 (7.84%) 06 (11.76%) 04 (7.84%) 07 (13.73%) 37(72.55%) 32(62.75%)	0.00 0.003 0.029 0.090 0.014 0.028 0.364 0.028 0.821 0.009 0.997
7	Which of the Periodontal conditions need a systemic antimicrobial prescription	A-Periodontal pockets B-Gingival abscess C-Pericoronitis D-ANUG E-Endo-perio lesion F-Periodontal abscess G-Generalized periodontitis H-Gingivitis I-Flap surgery J-Aggressive periodontitis K-Implant placement L-Root planing M-Operculectom	12 (20.34%) 29 (49.15%) 38 (64.41%) 42 (71.19%) 34 (57.63%) 47 (79.66%) 11 (18.64%) 05 (8.48%) 32 (54.24%) 26 (44.07%) 25 (42.37%) 15 (25.42%) 21 (35.59%)	17 (33.33%) 33 (64.79%) 38 (24.51%) 32 (62.75%) 23 (45.09%) 26 (50.98%) 10 (19.61%) 10 (19.61%) 23 (45.09%) 19 (37.25%) 19 (37.25%) 14 (27.45%) 18 (35.29%)	0.123 0.101 0.253 0.347 0.190 0.001 0.898 0.090 0.339 0.469 0.585 0.810 0.974
8	Which of the following Periapical pathologies required systemic	A-Asymptomatic chronic periapical pathology B-Acute periapical abscess with no signs	12 (20.34%) 23 (38.98%) 34 (57.63%)	19 (37.25%) 22 (43.14%) 35 (68.63%)	0.049 0.659 0.234

	antimicrobial prescription	of fever	49 (83.05%)	41 (80.39%)	0.718
		C-Periapical abscess with fever	26 (44.07%)	19 (37.25%)	0.469
		D-Periapical pathology progressed into cellulitis	19 (32.20%)	15 (29.41%)	0.752
		E-Discharge from endodontically treated teeth			
		F-Avulsion and reimplantation			
9	Oral surgical conditions need an antimicrobial prescription	A-Asymptomatic 3 rd molar extraction	17 (28.81%)	25 (49.01%)	0.030
		B-3 rd molar extraction with concurrent Pericoronitis	45 (76.27%)	42 (82.35%)	0.434
		C-Orthogenetic surgical procedures with high risk of infection	43 (72.88%)	35 (68.63%)	0.624
		D-Mandibular fracture without oral communication	20 (33.90%)	23 (45.09%)	0.230
		E-Mandibular fracture with oral communication	37 (62.71%)	28 (54.90%)	0.406
		F-Major head and neck surgery	39 (66.01%)	23 (45.09%)	0.027
		G-Dental implants	31 (52.54%)	20 (39.22%)	0.162
10	Which of the following Oral mucosal condition requires antimicrobials	A-Leukoplakia	12 (20.34%)	20 (39.22%)	0.030
		B-Erythroplakia	06 (10.17%)	15 (29.41%)	0.010
		C-Traumatic ulcers	06 (10.17%)	22 (43.13%)	0.000
		D-Denture induced hyperplasia	0 (0%)	03 (5.88%)	0.059
		E-Lichen planus	12 (20.34%)	16 (31.37%)	0.185
		F-Fordyce granules	03 (5.08%)	06 (11.77%)	0.202
		G-Oral candidiasis	43 (72.88%)	28 (54.90%)	0.049
		H-Hairy leukoplakia	17 (28.81%)	12 (23.53%)	0.496

Dental practitioners were prescribed systemic antimicrobials for the following Oral surgical conditions, 3rd molar extraction with concurrent pericoronitis, Orthogenetic surgical procedures with a high risk of infection, Mandibular fracture without oral communication, Mandibular fracture with oral communication, Dental implants were not statistically significant ($P \geq 0.05$), but Asymptomatic 3rd molar extraction and major head and neck surgery were statistically significant ($P \leq 0.05$). For oral mucosal conditions, the difference between the BDS and MDS practitioners was statistically significant.

Those conditions were Leukoplakia ($P=0.030$), Erythroplakia ($P=0.010$), Traumatic ulcers ($P=0.00$), Oral candidiasis ($P=0.049$). But the conditions like Hairy leukoplakia, Denture induced hyperplasia, Lichen planus, Fordyce granules were not statistically significant ($P \geq 0.05$) **Table 4**.

Pediatric patients reported with severe spreading dental infection, 28.81 % of BDS and 50.98 % of MDS practitioners have increased the dosage of antimicrobial drugs, but 57.62% of BDS and 39.22% of MDS practitioners were not increasing dosage of antimicrobial drugs for severe spreading dental infections. For fungal infections like

Pseudomembranous candidiasis BDS (71.19%) & MDS (74.51%), dental practitioners commonly prescribed fluconazole as the drug of choice. The periodontal infections like necrotizing ulcerative gingivitis, both BDS (72.88%) and MDS (56.86%) dental practitioners commonly preferred metronidazole & amoxicillin. But alcoholic patients and under warfarin medication, in these conditions, most of the dental practitioners' BDS (50.85%) and MDS (50.98%) were not prescribed metronidazole. The difference between BDS and MDS was statistically significant ($P=0.026$) **Table 4**.

DISCUSSION: Most human oral infections originate from odontogenic infections. The prescribing of antimicrobials by dental practitioners has become an important aspect of dental practice. Dentists benefited greatly from the discovery of penicillin because it is a broad-spectrum antibiotic and covers most oral infections. On the other hand, antimicrobial use is the key driver of resistance. This is mainly due to its overuse in many parts of the world, particularly for minor infections, misuse due to lack of access to appropriate treatment.

Clinical situations that require antimicrobial therapy include infections accompanied by elevated body temperature and evidence of systemic spread

like lymphadenopathy and trismus¹⁰. Facial cellulitis is a serious disease that should be treated by antimicrobials promptly because of the possibility of infection spread via lymph and blood circulation, with the development of septicemia². Dentists involved in this survey were prescribed antimicrobials for orofacial infections with systemic signs of involvement, which was appropriated according to scientific literature. The present study was conducted to assess the knowledge of antimicrobial prescription for common oral infections and suggested the contribution of dentistry toward the development of antimicrobial resistance. The majority of participants were more than 30 years of age and male (64.6%), similar to few studies; most of them had undergraduate qualifications and up to 10 years of work experience^{2, 11, 12}.

Amoxicillin was the most preferred antibiotic in the current study, either alone or in combination. In most previous studies, amoxicillin and its combination with clavulanic acid were found to be the most common prescription due to its wide spectrum with a low incidence of resistance with minimum adverse effects^{11, 16, 17, 20, 21, 22}. Most of the orofacial infections resolve in 3 to 7 days^{23, 24, 25}. In our survey majority of study, dental practitioners were prescribed antimicrobials for 5 days. This study showed that most of the dentists were prescribed systemic antimicrobial drugs for the cases of tooth sensitivity, halitosis, simple tooth fracture, dental caries and its sequels like pulpitis, apical periodontitis, periapical abscess, gingivitis, gingival abscess, simple extraction, root planing, operculectomy, and traumatic ulcers.

This would be an alarming finding among the dental practitioners' misuse of antimicrobials because the conditions mentioned above are not indicated for antimicrobial therapy. These could be managed adequately with local interventions. The prescription pattern was similar to some of the previous studies^{13, 18}. Extractions performed in aseptic conditions do not require antimicrobials, while Pericoronitis is an inflammatory condition that could be managed with anti-inflammatory/analgesics. Similarly, endodontic conditions such as irreversible pulpitis and apical periodontitis could be managed with root canal therapy. In previous studies, Pericoronitis, surgical

removal of the impacted molar, cellulitis, flap surgery, aggressive periodontitis, implant placement, Dentoalveolar abscess, discharge from endodontically treated teeth, avulsion and replantation, acute necrotizing ulcerative gingivitis, and chronic periodontitis were reported with a high rate of systemic antimicrobial prescriptions^{2, 12, 14, 16, 17}. According to American Heart Association¹⁹, antibiotics were routinely administered as a prophylactic measure for surgical procedures with a high infection rate and/or implantation of prosthetic devices, flap surgery, dental implant placement, and surgical removal of the impacted tooth, reimplantation of teeth, endodontic instrumentation or surgery beyond the tooth apex. In this present survey, 71.82% of dentists were found to be prescribing antibiotics prophylaxis for these conditions.

And also, 53.64% of participants were not prescribed antibiotic prophylaxis for the shedding of deciduous teeth, bleeding from trauma to the lips. In this survey, dental practitioners (51.82%) were found to be prescribing antibiotic prophylaxis as per the guidelines of (AHA) for following cardiac conditions like infective endocarditis and compromised immunity, patients with shunts, indwelling vascular catheters & medical devices and prosthetic joints indicated in risk patients in the context of any invasive procedure within the oral cavity¹⁹. For the oral mucosal conditions like leukoplakia, Fordyce granules, hairy leukoplakia, denture-induced hyperplasia, lichen planus most of the dental practitioners had prescribed systemic antimicrobial drugs.

But conditions mentioned above are not recommended for antimicrobial therapy²⁶. In this survey viral infection in the Oro-facial region, most of the dental practitioners were prescribed Acyclovir as the drug of choice. For fungal infections, most dental practitioners commonly prescribed fluconazole as the drug of choice, and they calculated the drug dosage based on age and weight of the patients²⁵. For managing severe and recurrent orofacial infections, most dental practitioners preferred the antibiotic culture sensitivity test⁹. Based on this cross-sectional survey, the overall knowledge of antimicrobial prescription and antimicrobial resistance among dental practitioners was comparatively lower than

previous studies 2, 9. The antimicrobials were prescribed indiscriminately, inappropriately, and injudiciously to manage the oral diseases. Since dental diseases are predominantly due to local factors, the mere removal of the local causative factors reduces the need for prescribing antimicrobials considerably. It is, therefore, suggested that antimicrobials should be used as an adjunct and not a replacement for definite treatment. In the absence of signs and symptoms of infections, dental practitioners should abstain from prescribing antimicrobials for relieving pain. It is required to analyze the condition before prescribing antimicrobials to the patients.

CONCLUSION: At the level of dental practitioners should promote the antimicrobial prescription only when needed and also select the right drug, dose and duration while prescribing and testing to confirm when in doubt is recommended. In India, dentists are facing some of the challenges to conflict with the issue of antimicrobial resistance are the lack of surveillance systems and operating guidelines for antimicrobial prescription, over the counter sale of antimicrobials and lack of public awareness.

To overcome this growing global problem, this study strongly recommended that separate guidelines for antimicrobial prescriptions, CDE programs, and emphasis on dental pharmacology in the curriculum address the issue of antimicrobial resistance.

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