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Knowledge and practices regarding antibiotic prescription and resistance among private dental practitioners in chennai city: A cross-sectional survey

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Abstract

Aim: To assess the knowledge and practices regarding antibiotic prescription and development of resistance among private dental practitioners in Chennai city, Tamilnadu, India.

Method: A cross-sectional survey was conducted among 280 practitioners in Chennai registered under IDA, selected by simple random sampling. A structured proforma was administered, to obtain data. Descriptive statistics were calculated and Chi-square test was carried out to check the significant difference. Level of significance was set at 5%.

Results: Majority of the participants were specialists (62.1%). Study participants with postgraduate qualification were more likely to know the current guidelines for antibiotic prophylaxis and was found to be highly statistically significant (p=0.000) Many practitioners believed that self-prescription by patient (84.3%) and over-prescription by dentist (74.3%) may lead to the development of AMR.

Conclusion: The present study results concluded that low knowledge and guideline-incongruent therapeutic prescribing practices were observed. This indicates a need for development of targeted interventions to promote judicious antibiotic use among the dentists.

Keywords: antibiotics, dental practitioners, knowledge, practice, AMR

1. Introduction

Antibiotics have emerged as a boon to humanity and this advancement has led to a better quality of life and reduction of morbidity and mortality [1]. However, the horizon of therapeutic management of infectious diseases is shrinking fast. The addition of antimicrobials to the armamentarium against infectious agents is far less than the drugs being discarded because of antibiotic resistance [2].

In a study by Center for Disease Control (CDC), Dentists prescribe between 7% and 11% of all common antibiotics [3]. Although a number of studies on antibiotic use have been carried out, as per the National Center for Disease Control and Prevention, approximately one-third of all outpatient antibiotic prescriptions are unnecessary [1]. Though, nobody can deny the value of antibiotics in the management of orofacial infections, it should be kept in mind that it is to be used as an adjunct and not a substitute for a definite treatment [4].

Prescribers play a prominent role in the prevention of resistance; by rational prescribing, providing health education and also by promoting patient awareness pertaining to safe medication practices in the community with respect to antimicrobials [5]. However, this can only be possible if the health care providers are aware and adhere to available antibiotic prescription guidelines [6].

Antimicrobial resistance (AMR) has been identified as a global health threat with serious health, political and economic implications [7]. Inappropriate, indiscriminate, and irrational use of antibiotics has led to the development of antibiotic resistance [1]. Awareness on seriousness of the resistance is initial measure towards confining its further progress [5]. The increasing resistance problems of recent years are probably related to over- or mis-use of broad-spectrum agents such as cephalosporins and fluoroquinolones [8]. One factor that may contribute is inappropriate use of antibiotics in veterinary medicine, agriculture, medicine and, possibly, dentistry [9]. These serious complications associated with antibiotics use have encouraged studies investigating antibiotic prescribing practices of dentists [8].

Hence, keeping in the mind trend of increasing antibiotic prescription in dentistry each year, it is required to assess the knowledge and practice among dental practitioners. Therefore, the study was conducted with the objective to assess dental practitioner's knowledge and practices regarding antibiotic prescription and development of resistance.

2. Materials and Method

A cross-sectional study was carried out among 280 private Dental practitioners in Chennai city from August to September 2019. Ethical clearance was obtained from the Institutional Review Board of Vydehi Institute of Dental Sciences and Research Centre, Bengaluru. A written informed consent was obtained from all the participants. Private dental practitioners registered under the Indian

Dental Association (IDA)-Chennai branch was included in the study while those dentists who were not willing to participate and who had not filled questionnaire completely were excluded.

A pilot study was conducted among 25 private dental practitioners, to check the feasibility and also to validate the questionnaire. Sample size was scientifically obtained based on the pilot study with 80% power, α=0.05, 95% confidence interval, 5% margin of error. The final sample size was 280. A self-structured, pre-tested, closed-ended questionnaire in English, comprising of 18 questions that consisted of demographic details and questions pertaining to knowledge and practice regarding antibiotic prescription and resistance that are followed in clinical practice was developed. Internal consistency of the questionnaire was assessed by using Cronbach's α and it was found to be 0.81 (good) and the total sample were then taken according to simple random sampling by employing lottery method.

The questionnaires were distributed to the randomly selected participants personally by the investigator in their respective workplaces and all the questions were explained to avoid any ambiguity. The participants were given sufficient time to answer the pro forma and was collected back on the same day or the next day and checked for its completeness. The response rate was 100%.

The statistical tool namely SPSS v.20, IBM Chicago was used for analysis of the data. Descriptive statistics were calculated. Chi square test was done to statistically test the difference in proportion according to their demographic details and p-value was fixed at 0.05(5%).

3. Results

A total of 280 private dental practitioners participated in the study. The gender distribution consisted of 161(57.5%) males and 119(42.5%) females. With regard to age of the participants, majority were among age groups was 31-40 years, representing 42.5%. Nearly, 45% of the study participants in the present study had <5 years of experience as dental practitioners, 33.7% had 5-10 years experience and 21.4% had >10 years of experience. Also majority of the participants (61.5%) were postgraduates. (Table 1)

As shown in figure 1, it was identified that a worrisome proportion of the study participants were prescribing amoxicillin and metronidazole (40%) as their first choice of antibiotic followed by amoxicillin in combination with clavulanic acid (27.9%) or alone (17.5%) and ciprofloxacin (9.2%).

Statistically significant difference was found between undergraduate and postgraduate dental practitioners with respect to prescription for simple extraction ($p<0.001$), periodontal pocket ($p=0.02$), pericoronitis ($p<0.001$), abscess ($p=0.01$) and post-implant placement ($p<0.001$) (Table 2).

When management of dental infections was assessed, 27.1% of dentists prescribed another course of the same antibiotic and 35.4% prescribed another antibiotic itself for management of recurrent orofacial infections without understanding the sensitivity of micro-organisms. However, when poor response was encountered with a particular antibiotic, samples were sent for antibiotic sensitivity test by 37.5% of the dentists. When years of experience was cross-tabulated against the response for management of dentoalveolar abscess, a statistical significant difference was found, with 42.5% dentists preferring an incision and drainage for their patients under antibiotic coverage and the remaining participants (57.5%) prescribe antibiotics on the first visit and schedule an appointment for drainage (Table 3).

Figure 2 depicts the non-clinical factors influencing the choice of the antibiotic prescribed. In this study, patient's preference (31%), effectiveness and previous experience with the drug (21%) and knowledge gained through UG and PG training (10%) affected the antibiotic prescription whereas availability in the nearby pharmacy (7%), cost of the antibiotic (5%) and reading scientific materials (4%) influenced to a smaller extent.

The term AMR was familiar to 97.5% participants. Majority of the dentists responded that injudicious prescription by the health professionals (74.3%) and self-medication by the patients (84.3%) were contributing to be the possible causes of AMR. Among the surveyed dentists, almost one fourth (25.7%) have already encountered few cases of antibiotic resistance. (Figure 3) In this study, the knowledge and practice of current guidelines for antibiotic prophylaxis was found to be statistically significant ($p=0.00$) with experience and age of the participants, as well as, their designation.

When different demographic details were cross-tabulated against the responses for various questions on knowledge, it was seen that responses to questions, *viz*., Self-medication by patient can cause AMR was significantly associated with age, Aseptic precautions are enough and antibiotic prescription is an absolute necessity were significant with respect to gender. Antibiotic prescription is an absolute necessity was also significant among those participants with respect to qualification and experience with the proportion of the participants with postgraduate qualification and greater experience likely to have better scores as shown in Table 4.

Similarly, when different demographic details were cross-tabulated against the responses for various questions on practice, Dentists with age ranging >30 years, with postgraduate qualification, and with >10 years of experience were more likely to respond correctly to the questions (Table 5).

Table 1: Sociodemographic and professional distribution of the surveyed dentists in private dental clinics in Chennai city (2019)

Demographic Variables	n (280)	Percentages
Gender		
Male	161	57.5
Female	119	42.5
Age groups (years)		
<30	102	36.4
31-40	119	42.5
41-50	52	18.6
>50	07	2.5
Qualification		
BDS	106	37.9
MDS	172	61.4
PhD	2	0.7
Years of experience		
<5	126	45.0
5-10	94	33.7
>10	60	21.4

Table 2: Responses of study subjects to antibiotic prescribing practices (In percentages)

Oral conditions	BDS (n=106)	MDS (n=172)	Total (n=280)	p
Dental caries	14.1	6.3	9.3	0.54
Dental caries with pulpitis	34.9	26.2	29.6	0.18
Apical periodontitis	59.4	62.2	61.1	0.24
Endodontic treatment	83.9	83.1	83.2	0.36
Simple extraction	67.9	44.2	52.9	0.00***
Open extraction	98.1	96.5	97.1	0.87
Impaction	100	98.8	99.3	0.73
Periodontal pocket	34	15.7	22.5	0.02*
Flap surgery	78.3	66.8	71.1	0.4
Tooth fracture	19.8	18.6	18.9	0.76
Periapical surgeries	94.3	91.2	92.5	0.83
Pericoronitis	84	83.8	83.6	0.00***
Abscess	94.3	100	97.9	0.01**
Implant placement	94.3	91.3	92.5	0.00***

Result of Chi-square statistic. *p≤0.05 – significant, **p < 0.01– highly significant; ***p < 0.001– very

Table 3: Responses of study subjects regarding management of dental infections (In percentages)

Dental Infections	Years of Experience			Total	p
	≤ 5 (n=126)	6 - 10 (n=94)	>10 (n=60)	(n=280)	
Recurrent orofacial infection					0.217
Prescribe another antibiotic	48	32	19	99	
Antibiotic sensitivity testing	54	29	22	105	
Prescribe another course	24	33	19	76	
Dentoalveolar abscess					0.011*
Antibiotics and appointment	63	67	31	161	
Drainage and Antibiotics	63	27	29	119	

Result of Chi-square statistic. *p≤0.05 – significant

Table 4: Frequency and percentage distribution of study participants according to responses to knowledge questions

Questions	Yes	No	Yes											
			≤30 years	>30 years	x^2 value	Male	Female	x^2 value	BDS	MDS	x^2 value	≤10 years	>10 years	x^2 value
Aseptic precautions are enough	147 (52.5)	133 (47.5)	51 (50)	96 (53.9)	0.073	92 (57.1)	55 (46.2)	0.011*	54 (50.9)	91 (52.9)	0.384	112 (50.9)	35 (58.3)	0.737
Antibiotic prescription is an absolute necessity	220 (78.6)	60 (21.4)	75 (73.5)	145 (81.4)	0.113	133 (82.6)	87 (73.1)	0.021*	78 (73.6)	141 (81.9)	0.042*	169 (76.8)	51 (85)	0.008**
Aware of the term "AMR"	273 (97.5)	7 (2.5)	98 (96.1)	175 (98.3)	0.599	155 (96.3)	118 (99.2)	0.302	102 (96.2)	169 (98.2)	0.760	215 (97.7)	58 (96.7)	0.51
Injudicious prescription by the dentist can cause AMR	208 (74.3)	72 (25.7)	79 (77.5)	129 (72.5)	0.499	115 (71.4)	93 (78.2)	0.359	85 (80.2)	121 (70.3)	0.214	169 (76.8)	39 (60)	0.29
Selfmedication by patient can cause AMR	236 (84.3)	44 (15.7)	88 (86.2)	148 (83.1)	0.035*	134 (83.2)	102 (85.7)	0.766	88 (83)	146 (84.9)	0.868	189 (85.9)	47 (78.3)	0.453

Result of Chi-square statistic. *p≤0.05 – significant,**p < 0.01– highly significant; ***p < 0.001– very highly significant

Table 5: Frequency and percentage distribution of study participants according to responses to practice questions

QUESTION	YES	NO	Yes											
			≤30 years	>30 years	x^2 value	Male	Female	x^2 value	BDS	MDS	x^2 value	≤10 years	>10 years	x^2 value
Does prescription vary for anaerobic infection	232 (82.9)	48 (17.1)	93 (91.1)	139 (78.1)	0.023*	131 (81.4)	101 (84.9)	0.803	95 (89.6)	135 (78.5)	0.241	184 (83.6)	48 (80)	0.021*
Inquiry about recent antibiotic course	224 (80)	56 (20)	86 (84.3)	138 (77.5)	0.34	123 (76.4)	101 (84.9)	0.181	94 (88.7)	128 (74.4)	0.026*	181 (82.3)	43 (71.7)	0.548
Inform about consequence of compliance	215 (76.8)	65 (23.2)	80 (78.4)	135 (75.8)	0.79	122 (75.8)	93 (78.2)	0.76	82 (77.4)	131 (76.2)	0.806	170 (77.3)	45 (75)	0.306
Encountered any case of AMR	72 (25.7)	208 (74.3)	20 (19.6)	52 (29.2)	0.15	8 45 (27.9)	27 (22.7)	0.49	617 (16)	54 (31.4)	0.026*	50 (22.7)	22 (36.7)	0.044*

Result of Chi-square statistic. *p≤0.05 – significant, **p < 0.01 – highly significant

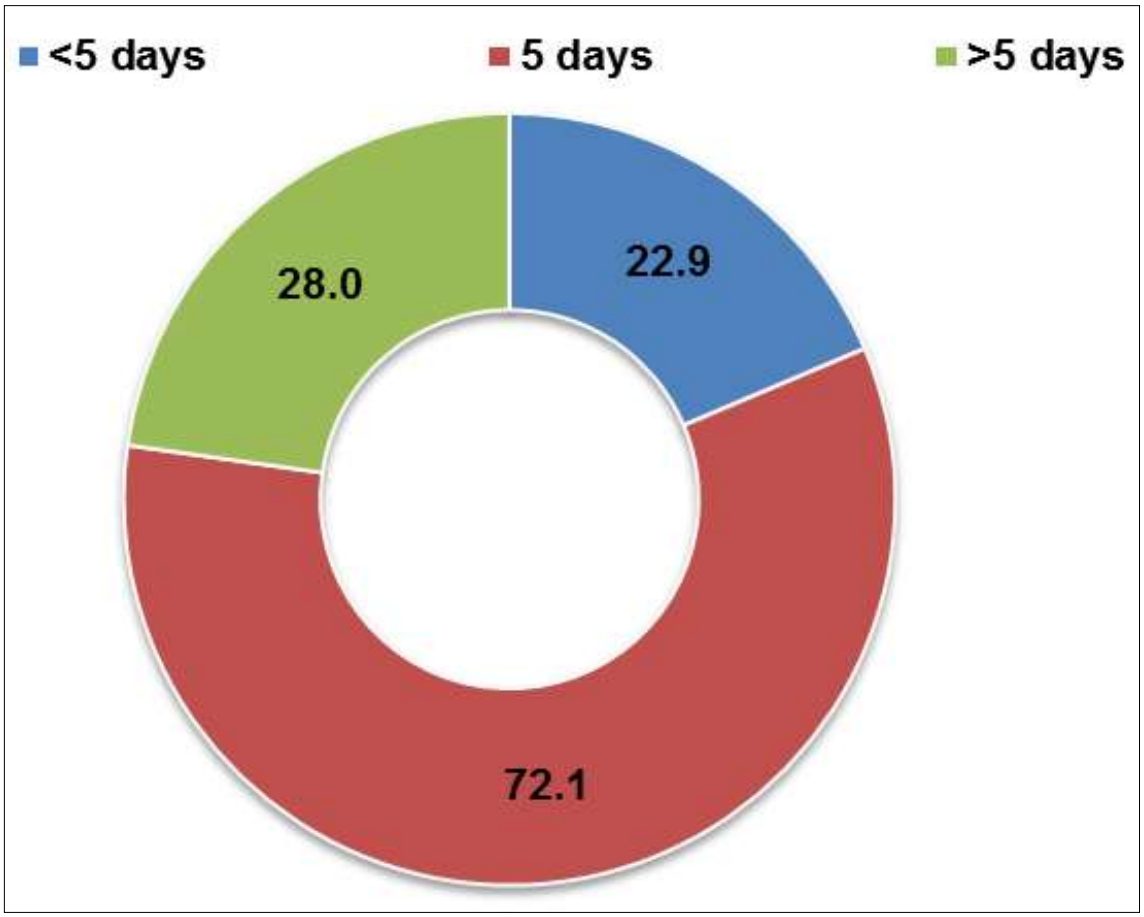

Fig 1: Figure showing the duration of antibiotic course (In percentages)

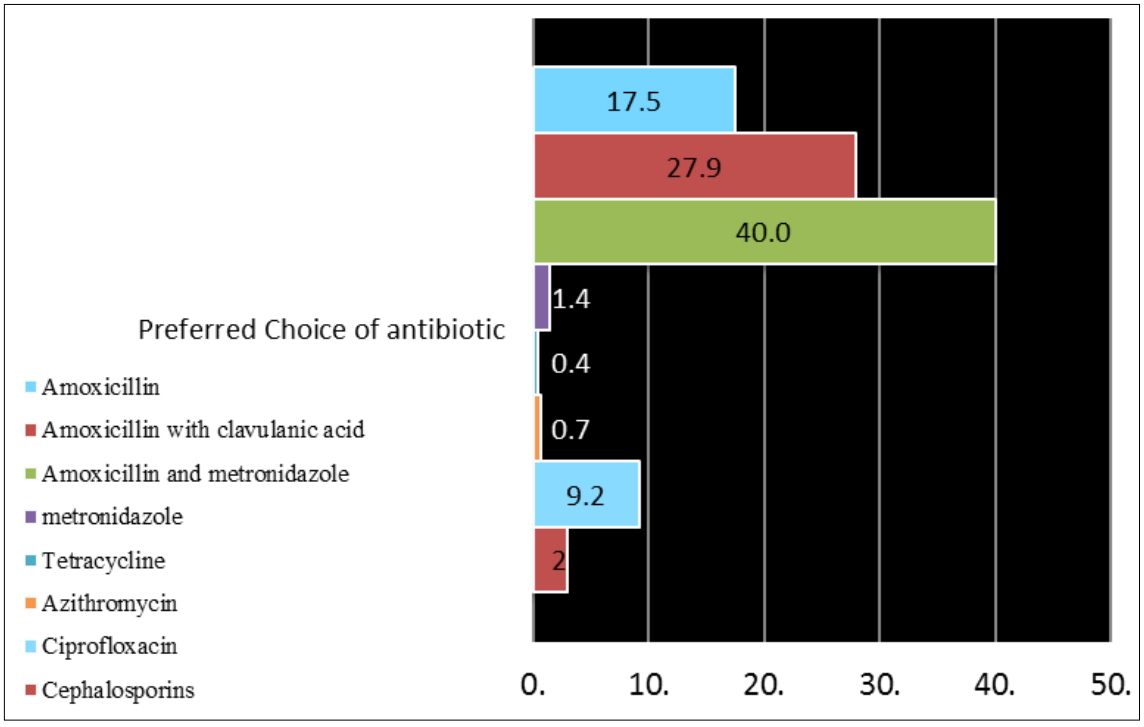

Fig 2: Figure showing the preferred antibiotic of choice (In percentages)

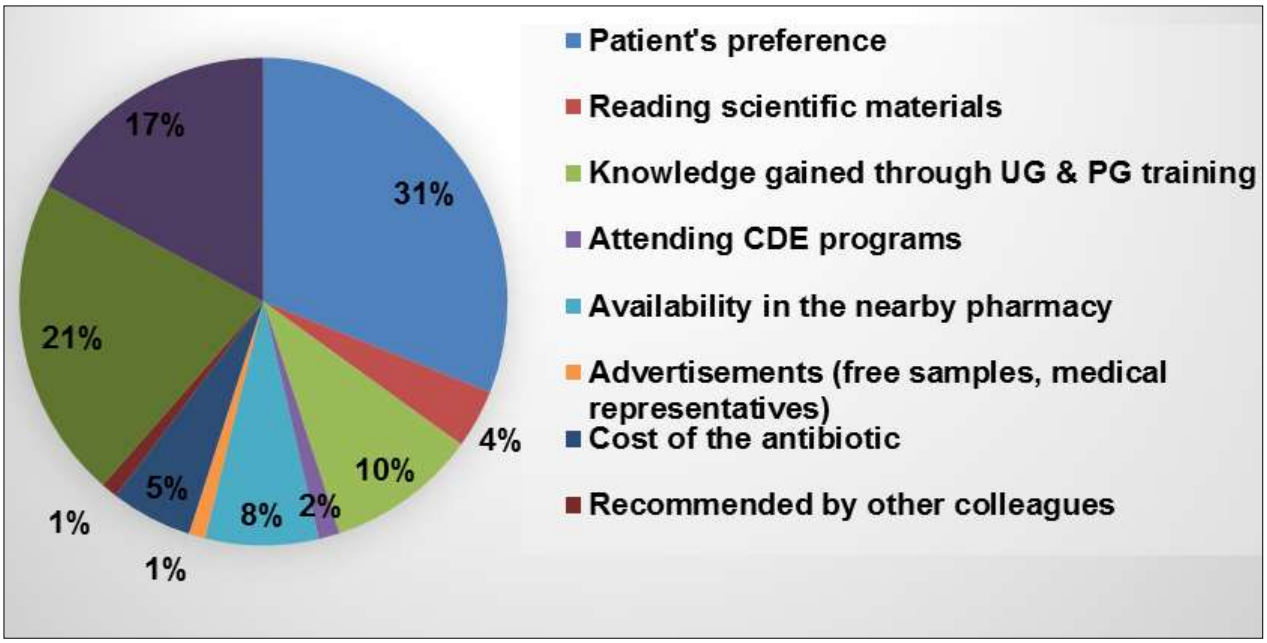

Fig 3: Figure showing factors affecting the choice of antibiotic prescription (In percentages)

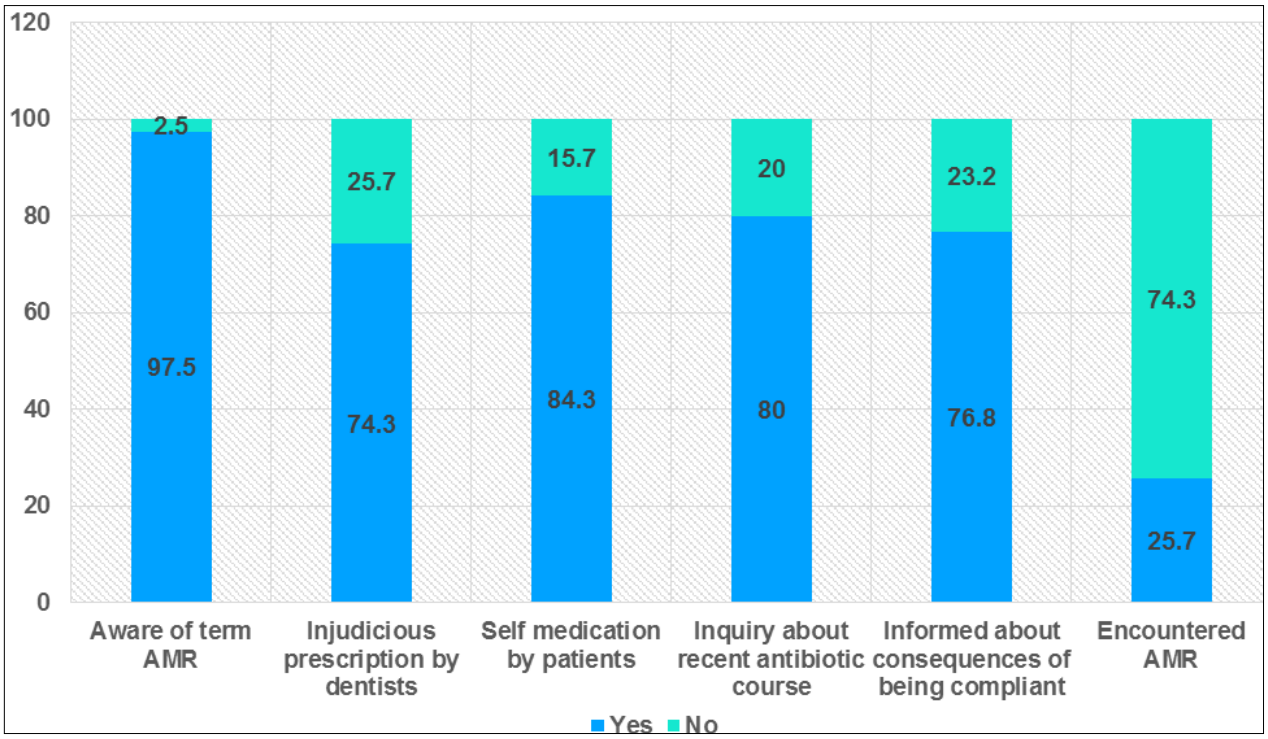

Fig 4: Graph showing the responses of study participants for knowledge regarding antibiotic resistance (In percentages)

4. Discussion

Antimicrobials are given prophylactically before dental procedures, during treatments, after treatment or as the only form of treatment. Unfortunately the last type of prescription is very common in developing countries like India where a large fraction of population cannot afford dental treatment in private dental setups [3]. Hence, keeping in mind the findings of previous researches that suggests dentistry's contribution towards development of AMR, the present study aimed to uncover antibiotic over prescription practices for odontogenic infections.

The sample was representative of all the sectors that provide dental care in Chennai city. We included general dental practitioners those who are not associated with any academic institution as they are not exposed to any updates in the field on day to day basis. In the present study, majority of the participants (78.9%) were under 40 years of age and male which is in accordance to few studies [10-12].

Overall, adherence to the ADA clinical guidelines was low (55.7%). Although most clinical situations are specific to the patient, the ADA guidelines might be more helpful if they contained representative clinical cases to illustrate recommended prescribing practices [13].

In this survey, antibiotics were prescribed for managing oral conditions like dental caries with pulpitis (29.6%), post endodontic treatment (83.2%), simple extraction (52.9%), dysimpaction (99.3%), periodontal pocket (22.5%), tooth fracture (18.9%), pericoronitis (83.6%) which suggest the overuse of antibiotics. Similarly, few studies done in developing countries [14, 15] reported that abuse of

prophylactic antibiotics was to prevent postoperative infection following surgical dental manipulations[16] or to cover either a defect in aseptic clinical technique; thus, a 'just in case' principle is practiced [15]. The results of this study revealed that 72.1% prescribed antibiotics for 5 days and the prescription pattern was similar to studies by Goud SR, *et al*. 2012 [11], Lisbao SM, *et al* 2015 [17]. The explanation for this is the duration of treatment recommended in therapeutic guidelines is most commonly based on expert opinion [18]. A combination of Amoxicillin with metronidazole (40%) was the most commonly preferred drug subsequent to different dental procedures, however, the previous studies reported by Martinez, *et al* 2000 [19], Jaunay T, *et al* 2000 [20], Lisbao SM, *et al* 2015 [17] showed amoxicillin to be the most commonly used. Adding a drug with anaerobic cover like metronidazole has a synergistic effect [21]. However, it results in depression of the normal host flora due to broad- spectrum exposure [22]. On the other hand, our sample showed evidence of factors fostering antimicrobial resistance. The major concern of superfluous usage of antibiotics is the emerging resistant strains of microorganisms [4]. In India, sale of drugs without prescription is almost common practice [23]. The self-medication for dental procedures is also an alarming situation which results in antibiotic resistance leading to the raise of super bugs that can adapt to resist even the last line drugs [24]. This is in accordance with this survey results (84.3%). Also, the dental fraternity needs to recognize that they have a sizable contribution towards antimicrobial resistance and if immediate steps are not taken to curb unnecessary prescriptions, it can become a global threat [3].

We need to consider these results in light of some limitations. First, our cross sectional study included only private dental practitioners in Chennai city and may not be generalisable to the entire dentist population. Secondly, the cross sectional design limited our ability to draw causal inferences. And because the survey was self-administered and based on clinical conditions, responses may have been susceptible to response bias.

5. Conclusion

Findings of this cross sectional survey suggest that dental practitioners are significant contributors to outpatient antibiotic prescriptions in Chennai - a metropolitan city, the state capital of Tamil Nadu. There appears to be a lack of concordance between recommended professional guidelines and antibiotic prescribing practices of dentists. With appropriate education, training and updates about the same will help in proper prescription of antibiotics, thereby benefiting the patients. Further studies should evaluate the prescription practices among the general dental practitioners at definite intervals. The dental profession as a whole needs to commit to a deeper understanding of the global effect of unnecessary antibiotic prescription.

6. References

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