

Assessment of Awareness and Approach Regarding Antibiotic Prescription and Resistance among Different Level of Dental Students in a Tertiary Care Dental College, Karachi



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OBJECTIVE: To evaluate the awareness and approach of dental students regarding antibiotic prescription and its resistance due to irrational use of antibiotics. Antibiotic resistance is spreading alarmingly throughout the world, including developed countries. The common causes of antibiotic resistance include over prescription, incomplete treatment and inappropriate self-medication. Among different causes of antimicrobial resistance, irrational use of antibiotic is the most prominent one.

METHODOLOGY: After approved by the Institutional Ethics Committee of Ziauddin University this cross-sectional study was conducted from 1st April, 2020 to 30th July, 2020 at Ziauddin University. Third and final year dental students as well as house officers were enrolled and the computed sample size was 133 to which 5% non-response rate was added, therefore total 139 dental students were approached. Non-probability convenience sampling technique was used. A self- designed, self-administered questionnaire was prepared to collect the demographic data and information regarding the prescription pattern of antibiotics amongst study subjects. All questions in the questionnaire were close ended. The questionnaire comprised information pertaining to demographic characteristics, standard guideline for antibiotic prescriptions, antibiotic stewardship and resistance, improper prescription and its consequences. The dental students were briefed about the purpose of the study and the significance of participation and a written informed consent was obtained from them. The awareness of dental students regarding antibiotics was the outcome factor. The data was analyzed by using SPSS version 22.

RESULTS: Out of total 139 dental students majority (79.1%) were familiar to standard antibiotic prescription guidelines (87.8%) responded amoxicillin is beta lactam, for probability of antibiotic abuse and antibiotics aid in recovery of infections majority showed awareness (92.1% and 84.9% respectively). Almost equal students inquire recent antibiotic course prior to prescription (90.6%) as well as take extra caution prescribing antibiotic in immune compromised patients (89.9%).

CONCLUSION: This study concluded that majority of the dental students had good awareness regarding antibiotics and factors related to it, as participants responded positively to the 70% of awareness - based questions.

KEYWORDS: Awareness, Antibiotics, Resistance, Prescription, Dental Students.

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INTRODUCTION

In general practice, the cure of any disease is reliant on the use of drugs.¹ Since the accidental discovery of penicillin by Alexander Fleming in 1928, antibiotics

have been widely used in medical practice. Antibiotics are currently predominantly utilized in the obliteration of bacterial infections, either by killing them or slowing down their growth.² However, according to one study, up to 50% of antibiotics are deemed unnecessary, and resistance is one of the most serious challenges confronting medical practitioners.³ Antibiotic resistance occurs when microorganisms develop a mechanism to protect themselves from antibiotics in order to survive, rendering the antibiotic useless when used against that microorganism.⁴

Antibiotic resistance is spreading alarmingly throughout the world, including developed countries.⁵ In recent years,

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it has been identified as one of the primary causes of a high frequency of hospitalization, morbidity, and mortality.⁶ According to current data, the World Health Organization (WHO) estimates that 700,000 people die each year as a result of antibiotic resistance, and predicts that by 2050, antimicrobial resistance will be responsible for ten million deaths per year.⁷ Multiple studies from the USA reported that at least 500,000 patients infected with *C. difficile* need to be admitted in hospital and <14,000 people died.⁸ Antimicrobial resistance data in middle- and low-income countries are limited because of the challenges in conducting antimicrobial resistance surveillance.⁹

The common causes of antibiotic resistance include over prescription, incomplete treatment and inappropriate self-medication.¹⁰ Among different causes of antimicrobial resistance, irrational use of antibiotic is the most prominent one.¹¹ Irrational antibiotics can take many forms, including the use of too many medicines per patient (polypharmacy), the inappropriate use of self-medication (often with prescription-only medicines), in non-bacterial infections, outside clinical guidelines, or with inadequate dosage or inappropriate route of administration such as overuse of injections when oral formulations would be more appropriate.¹² The irrational drug has many bad consequences including treatment failure, compromise in patient health, and increased cost.¹³

Even in dentistry, antibiotic prescription for dental infection is a common practice. A study revealed that 12% of dentists adequately prescribed antibiotics as a prophylactic intervention and treatment.¹⁴ A study conducted in Australia revealed that antibiotics are not used vigilantly for various dental infections which has led to development of resistance.¹⁵ A study conducted in Karachi revealed that antibiotic prescription has been increased to 65% in past ten years in low middle-income countries like Pakistan.¹⁶

The World health Organization defines rational drug prescription as the use of fewest number of drugs to achieve the best potential impact in the shortest time and at the lowest possible cost.¹⁷ It is fact that appropriate antibiotic selection, dose and duration of treatment could prevent or slow down the emergence of antimicrobial resistance.¹⁸ The change in doctors' attitude have impact on the practice of their antibiotic prescription. Furthermore, if the doctors are aware of their practices regarding antibiotics prescription, they will grasp the guideline accordingly.¹⁹

To highlight the awareness about antibiotics use and to combat its resistance numerous agencies are in operation.^{20,21} Moreover, the World Health Organization (WHO) has recently focused on educating health care providers about proper prescription with step-by-step guideline.²²

Antibiotic stewardship is a key intervention to improve

prescribing practices at individual as well as combined professional level.²³ Infectious Disease Society of America (IDSA) defined 'antimicrobial stewardship' as that optimizes the indication, selection, dosing, routes of administration and duration of antimicrobial therapy to maximize clinical cure or prevention of infection while limits the collateral damage of antimicrobial use, including toxicity, selection of pathogenic organism and emerge of resistance. Antimicrobial stewardship program helps the clinician to improve quality of care and patient safety through increase rate of infection cure, reduce treatment failure and increase appropriate prescribing.²⁴

Large number of studies are conducted to assess the awareness & attitude of medical students on antibiotic resistance as well as stewardship, but few studies are there to measure the same in dental students.²⁵⁻²⁷ Keeping this lacuna in mind this study is initiated to assess the awareness and approach regarding antibiotic prescription in different level of dental students.

METHODOLOGY

The cross-sectional study was conducted at Ziauddin University and teaching hospital; Karachi from 1st april, 2020 to 30th july,2020 and enrolled third and final year dental students as well as house officers.²⁸ Because first- and second-year dental students are not in clinical practice at this level, they were excluded from the study. After approved by the Institutional Ethics Committee of Ziauddin University, the sample size was calculated using Open Epi calculator. The computed sample size was 133 to which 5% non-response rate was added. Out of 139 students seventy-two were dental students and sixty-four were house officers. Non-probability convenience sampling technique was used.

All students in the study understood simple English, and, hence, it is selected as interview language in questionnaire. A self- designed, self-administered questionnaire²⁹⁻³² was prepared to collect the demographic data and information regarding the prescription pattern of antibiotics amongst study subjects. All questions in the questionnaire were close ended. The questionnaire's reliability was verified by calculating the alpha-coefficient, Cronbach's which was found to be satisfactory. The questionnaire comprised information pertaining to Demographic characteristics, standard guideline for antibiotic prescriptions, antibiotic stewardship and resistance, improper prescription and its consequences. The questionnaire was filled by third and final year BDS students during class sessions by their teachers, to reduce information and selection bias. Data was obtained from house officers during their clinical rotations. The dental students were briefed about the purpose of the

study and the significance of participation and a written informed consent was obtained from them.

The data were analyzed by using SPSS version 22 and descriptive statistics were computed. The results were presented as means and standard deviations, frequencies, and percentages. The R software version 3.1.1 (GNU General Public License) was used for computing. The frequency and percentage (percentage) of individuals who answered correctly for the various questions relating to socio-demographic variables, awareness regarding antibiotic usage were displayed using descriptive statistics. The Chi-square test of independence was used to evaluate the frequency of accurate responses across dental students and house officer.

RESULTS

The demographic data revealed that out of total 139 study participants, 113 (81.3%) were females, whereas 89 (64%) of them were aged between 23-28 years. In our study 64 (46%) of the participants were house officers. Moreover, only 18 (12.9%) of them were in private practice (table 0).

Table 0: Distribution Of Demographic Variables

Parameters (n=139)		Frequency (%)
Age	18-22 years	48(36)
	23-28 years	89(64)
Gender	Male	26(18.7)
	Female	113(81.3)
Qualification	3rd Year BDS	42(30.2)
	4th year BDS	33(23.7)
	House officers	64(46)
Private clinical practice	Yes	18(12.9)
	No	121(87.1)

Regarding information related to participants' understanding of standard antibiotic prescribing guidelines most of the students were familiar (79.1%). Moreover, most students knew that amoxicillin is beta lactam antibiotic (87.8%). Whereas half of the participants were aware that prolong use of antibiotics lead to superinfection. (54.7%); Least responses were received about antibiotic stewardship (17.3%). It was pleasingly seen that most of the participants are aware that antibiotics are not necessarily required in all dental infections (65.5%). Majority of dental students replied in favor of probability of Antibiotic abuse (92.1%). More than 2/3rd of the respondents believed that antibiotics aid in recovery of infections (84.9%). Their responses were positive towards antibiotic misuse leading to resistance (95%). While

(77%) of the participants answered that they are aware that superinfection would be prevented by prescribing proper antibiotic dosage. Regarding, antibiotic stewardship 'role in reducing its resistance, half of the participants were in favor (49.6%). Association of better efficacy of antibiotic with cost is denied by majority of participants (71.9%). While the majority believe that antibiotic should be continued even if symptoms are relieved. (64.7%). Almost equal dental students responded in favor (51.1%) and against (48.9%) of prescribing antibiotics without any senior consultation. It is encouraging to note that maximum dental students used to inquire recent antibiotic course prior to prescription (90.6%). Most of the respondents prefer to take extra precaution for prescribing antibiotic in immune compromised patients (89.9%). It is surprisingly seen that (23%) of the responders

Table 1: Distribution of Awareness and approaches of Antibiotics Prescription among Dental Students

Q.#	Awareness Parameters (n=139)		Frequency (%)
1	Are you aware of standard guideline for antibiotic prescription	Yes	110(79.1)
		No	29(20.9)
2	Amoxicillin as beta lactam	Yes	122(87.8)
		No	17(12.2)
3	Information of super infection in association with prolong Antibiotic use	Yes	76(54.7)
		No	63(45.3)
4	Do you have concept of antibiotic stewardship?	Yes	24(17.3)
		No	115(82.7)
5	Antibiotic prescription for all dental infections	Yes	48(34.5)
		No	91(65.5)
6	Aware of probability of Antibiotic abuse	Yes	128(92.1)
		No	11(7.9)
7	Improper use of Antibiotic cause Antibiotic resistance	Yes	132(95)
		No	7(5)
8	Antibiotic use speedup recovery of infection	Yes	118(84.9)
		No	21(15.1)
9	Believe that costly Antibiotic work better	Yes	39(28.1)
		No	100(71.9)
10	Super infection prevented by prescribing proper Antibiotic dosage	Yes	107(77)
		No	32(23)
11	Does antibiotic stewardship helps in reducing Antibiotic resistance?	Yes	69(49.6)
		No	70(50.4)
12	Do you prefer antibiotic continual use even after symptoms were relieved?	Yes	90(64.7)
		No	49(35.3)
13	Advice Antibiotic use someone without senior consultation	Yes	71(51.1)
		No	68(48.9)
14	Course of antibiotic again prescribed to patients who had antibiotics exposure few weeks back.	Yes	126(90.6)
		No	13(9.4)
15	Extra caution prescribing Antibiotic in immune compromised	Yes	125(89.9)
		No	14(10.1)
16	Acute emergency due Antibiotic associated adverse effects	Yes	15(10.8)
		No	124(89.2)
17	Ever experienced Antibiotic resistance in practice	Yes	32(23)
		No	107(77)

experienced antibiotic resistance in their practice. While (10.8%) of the participants faced acute emergency due to antibiotic associated adverse effects (table 1).

Statistically a significant association between implementation of standard guidelines of antibiotic prescription with private clinical practices (p=0.011). In addition, correlation of prolonged antibiotic use leads to super infection also significant with private clinical practice. (p value 0.001). A significant association (p value 0.023) is seen between resistance due to improper antibiotic therapy and gender. While experience of antibiotic resistance in clinical practice is significantly correlate with different level of qualification (p=0.002) (table 2).

Table 2: Association of Demographic Variables with Study parameters

Variables(n=139)	Age	Gender	Qualification	Private clinical practice
Parameters	p-value	p-value	p-value	p-value
Are you aware of standard guideline for antibiotic prescription	0.508	0.275	0.074	0.011*
Knowledge of Amoxicillin as beta lactam	0.772	0.396	0.097	0.316
Information of super infection in association with prolong Antibiotic use	0.189	0.376	0.761	0.001*
Do you have concept of antibiotic stewardship?	0.338	0.519	0.634	0.062
Antibiotic prescription for all dental infections	0.058	0.41	0.456	0.114
Aware of probability of Antibiotic abuse	0.942	0.093	0.492	0.204
Improper use of Antibiotic cause Antibiotic resistance	0.831	0.023*	0.71	0.37
Antibiotic use speedup recovery of infection	0.559	0.35	0.759	0.464
Costly Antibiotic work better	0.418	0.452	0.642	0.389
Super infection prevented by prescribing proper Antibiotic dosage	0.306	0.385	0.389	0.046
Does antibiotic stewardship helps in reducing Antibiotic resistance?	0.323	0.13	0.546	0.215
Do you prefer antibiotic continual use even after symptoms were relieved?	0.788	0.066	0.846	0.46
Advice Antibiotic use someone without senior consultation	0.579	0.167	0.986	0.122
Course of antibiotic again prescribed to patients who had antibiotics exposure few weeks back.	0.576	0.547	0.421	0.151
Extra caution prescribing Antibiotic in immune compromised	0.724	0.509	0.345	0.569
Acute emergency due Antibiotic associated adverse effects	0.908	0.439	0.659	0.303
Experienced Antibiotic resistance in practice	0.889	0.412	0.002*	0.083

Figure 1: Distribution of demographic variables of dental students

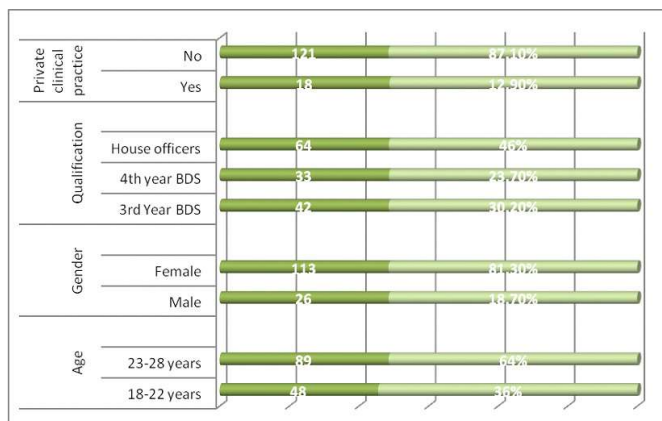
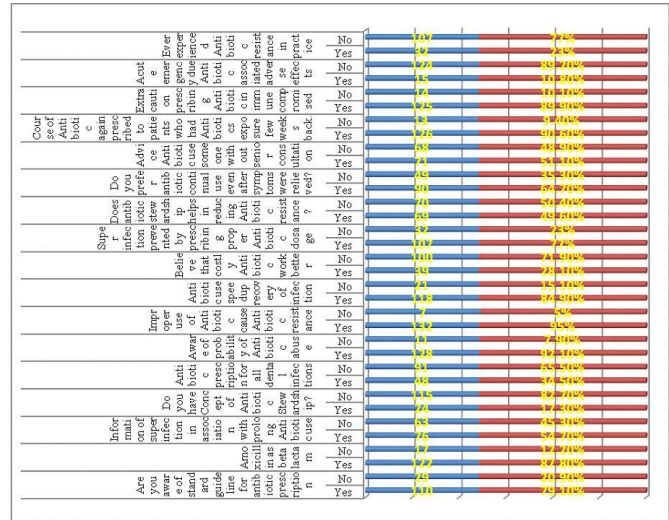


Figure 2: Distribution of Awareness and approaches of Antibiotics Prescription and its resistance among Dental Students



DISCUSSION

Antibiotics have shown to be a powerful and effective arsenal against a variety of diseases during the previous five decades. Today, the development of antibiotic-resistant pathogenic bacteria and their dissemination in the human population is an increasing problem around the world, posing a serious threat to public health in the twenty-first century, especially in poor nations.³³ Availability of antibiotic in Pakistan is as Over the counter (OTC). A study conducted in Pakistan supports this fact.³⁴ An Indian study also revealed that (76%) of the Indian population purchase medicine from pharmacy based on their peer' antibiotic experience prescribed by senior physician. This is in concordance to current study as this study revealed Almost equal dental students responded in favor (71%) and against (68%) of prescribing antibiotics without any senior consultation.

Another important issue is doctor mostly prescribe broad spectrum rather than narrow spectrum, even in scenarios where it is not needed, leading to antimicrobial resistance (AMR).³⁵ It was pleasingly seen in present study that most of the participants were aware that antibiotics are not necessarily required in all dental infections (65.5%). In Pakistan, dentistry school lasts four years, and students in their second year of BDS complete a pharmacology course that covers prescription, pharmacology and pharmacokinetics knowledge. They begin to apply this knowledge throughout their clinical rotations in third, fourth year as well as during their house job. Dentists are free to work once they have completed their internship. In many investigations, dentists' and dental students' knowledge of drug prescription has been found to be insufficient.¹⁶ This shows that dental training

should be enhanced throughout college years or while working as a house dentist. In order to train students and give them with the required ability to perform in a clinical setting, the medical curriculum should be well-rounded. There are gaps in the literature when it comes to evaluating antibiotic prescription among dental students. One study compared the prescription patterns of dental students in their last year and house officers.³⁶ The goal of this study is to determine the level of awareness and approach to antibiotic prescription and resistance among dentistry students at various levels. In our research, we discovered that dental students had a good but not perfect understanding of several elements of antibiotics; similar findings have been reported in previous studies.²⁹

The standard antibiotic prescribing guidelines were known by (79.1%) of the participants in our study. According to a survey done in India in 2017, (87.1%) of participants follow the rational prescription process. This could be related to dentistry school's curriculum, which includes instruction on how to write rational prescriptions.²⁸ Only (30%) of dental students followed WHO prescribing recommendations, according to Guzman's research, while the remainder did not since most of them were uninformed of the guidelines.³⁷ There was a significant correlation between the implementation of antibiotic guidelines and private practice in our research, indicating that they may have more autonomy in dealing with patients.

The results of this study revealed that (54.7%) were aware that superinfection has association with prolong antibiotic use while, a study conducted in India revealed that (83.8%) medical students aware that superinfection is an adverse effect of prolong antibiotic use.³⁸ In this study, we found that different levels of education were linked with the knowledge of superinfection associated with prolonged antibiotic usage. Another study revealed that higher education levels are certainly linked with better understanding.³⁹ It's encouraging to see that (90%) of the participants want to know about previous antibiotic courses before writing prescriptions. A study conducted in Lebanon in 2018 found that dentists follow a similar practice.⁴⁰ (92.1%) of the participants believed that there is an abuse of antibiotic at present. Similar results have been showed by a study conducted in UAE.⁴¹ In our survey, 64.7 % said they would finish their antibiotic course even if their symptoms improved, compared to 36.7 % who said they would quit taking antibiotics if their symptoms subside. On the contrary, according to a survey done in Lebanon, 48.5 % continue their antibiotic treatment even if their symptoms improve.⁴²

In our study, antimicrobial misuse was mentioned as a source of antimicrobial resistance by (95%) of the participants. In 2017, Jamhour reported that (83%) of Lebanon's 500

respondents were aware that antibiotic overuse can lead to microbial resistance.⁴³ In 2020, Higuaita-Gutiérrez and colleagues reported that medical students from three Medellín medical schools have low awareness of antibiotic use due to a lack of training in antibiotic use and bacterial resistance.⁴⁴ In the same year, Veses and colleagues found that awareness programs are needed to promote student use of antibiotics in young generations, particularly among pre-professional health sciences students, after surveying undergraduate dental students at Universidad Cardenal Herrera.⁴⁵ Due to lack of training, Tsopra in 2020 employed a game called 'Anti-bio Game,' in which students play the role of a doctor meeting patients in consultation, as a promising technique for enhancing understanding in antibiotic prescription.⁴⁶

Antibiotic resistance is a global public health problem and a potential threat to humanity, according to various stakeholders and health agencies, and there is utmost need to combat this threat immediately.⁴⁷ The majority of participants (90.6%) mentioned that knowing about antimicrobials and their appropriate use is crucial in their medical profession, indicating that future prescribers are concerned and aware of the extent and relevance of the issue. Aside from antibiotic prescribing, the ideas of developing antibiotic usage protocols in healthcare facilities should be taught as part of the undergraduate curriculum. Small group exercises that allow students to practice patient education skills, such as negotiating with patients about the need for antibiotics and educating them about effective antibiotic usage, should be a big element of the antibiotic curriculum for students. Only 17.3 % of the participants in our study responded about antibiotic stewardship. However, a study of medical and pharmacy students in East Africa found that pharmacy students had higher awareness of antibiotic stewardship. They believed their pharmacy degree program had covered antimicrobial stewardship concepts.⁴⁸ According to these findings, the undergraduate medical/dental curriculum should include and emphasize antimicrobial stewardship and resistance principles from early years in order to enhance correct prescribing practice of future doctors. Further, policymakers should organize educational programs and workshops frequently to keep students up to date about antibiotic prescription and its associated resistance.

According to our findings, (89.9%) would take extra cautions while prescribing antibiotics for immunocompromised. Only patients in the high-risk category should be covered, according to new guidelines from the American Heart Association.⁴⁹

There are certain limitations to our research. Recall bias could have influenced the responses. The students often do not practice what they tell. When the investigator is not there, their attitude may change. The outcome may not be

applicable to the entire society. To validate the results on a broader population, a qualitative study should be conducted. Prescribing medication is a skill that doctors in practically every medical specialty need. Newly qualified doctors are typically exempt from having to begin high-risk practical procedures, they are frequently expected to prescribe powerful medications from the first day of clinical practice. To guide their learning about future advancements, many graduates should require not only knowledge of today's pharmaceuticals, but also a firm basis in therapeutic concepts, based by a scientific understanding of drug action.

CONCLUSION

This study concluded that Majority of the dental students had good awareness regarding antibiotics and factors related to it as participants responded positively to the 70% of awareness based questions. More than 2/3rd 79.1% responded they were familiar to standard antibiotic prescription guidelines, 87.8% responded Amoxicillin is beta lactam; for probability of Antibiotic abuse and antibiotics aid in recovery of infections majority showed awareness (92.1% and 84.9% respectively). 95% of them were aware about the improper use of Antibiotic and its associated resistance. 77% were in favor that super infection prevented by prescribing proper antibiotic dosage. Almost equal students inquire recent antibiotic course prior to prescription (90.6%) as well as take extra caution prescribing antibiotic in immune compromised patients (89.9%).

Our study gives the insight of awareness of antibiotic prescription among dental students, which guides the concerns to know the pattern and will help to narrow down the gap between academic knowledge and professional practice. Our study also stimulates the requirement for introduction of some strategies, for example, clinical case-based and problem-based learning from early years of undergraduate training with precise emphasis on the both short-and long-term perilous effects of illogical prescriptions of antimicrobials.

CONFLICT OF INTEREST

None declared

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