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Article

Attitudes of Dental Students towards the Prescription of Antibiotics during Endodontic Treatment

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Abstract: Aim: This study aimed to evaluate the antibiotic-prescribing attitudes of dental students during the management of pulpal and periapical pathologies. Material and methods: This cross-sectional descriptive study concerned all the students in clinical training registered the 5 faculties of dental medicine in Morocco. A self-administered questionnaire was used, and completed via email addresses. Data were analyzed with Jamovi software. Quantitative variables are expressed as mean and standard deviation and qualitative variables as numbers and percentages. X2 and ANOVA tests were performed. The significance level was set at $p < 0.05$. Results: Three sixty-five students participated in this study. The average duration was 5.87 ± 1.45 No statistical difference was found between the different universities $p > 0.05$. Of most students 83.8% prescribe Amoxicillin first ; Amoxicilin in combination with clavulanic acid is prescribed by 9.2%. For patients with penicillin allergy, clindamycin was the most prescribed 53.9%, after followed by azitromycin at 20.9%. Antibiotics are prescribed for all pulp and periapical pathologies, whether acute or chronic. For acute pulpitis, a difference was statistically significant ($P=0.01$). Regarding acute apical periodontitis, a statistically significant difference between the different faculties was noted ($P=0.03$). For the apical abscess, the antibiotic prescription was higher at the public faculty of Casablanca 92.8% than in the other faculties ($P = 0.02$). Conclusion: It appears from this study the need for faculties of dentistry to develop innovative teaching models to improve the level of knowledge of students on antibiotics and their indications in endodontics.

Keywords: antibiotics; apical periodontitis; prescription; pulp pathologies; students

1. Introduction

According to the European Society of Endodontics, the use of antibiotics is recommended when the infection is persistent or systemic. Thus, for rational use, consensus conferences have been organized to codify their indications [1]. They are used in the following pathological situations: Acute apical abscess in medically compromised patients; patients at risk; Acute apical abscess with systemic involvement: localized swellings, fever $> 38^\circ$, asthenia, insomnia, malaise, lymphadenopathy, trismus, progressive infections, rapid onset of severe infections, and dental reimplantation after expulsion [2]. Consequently, the prescription of antibiotics is not systematic in endodontics. Therefore, their inappropriate use can contribute to the occurrence of antibiotic resistance. The Lancet Infectious Diseases Commission has published a series of articles that sound the alarm on antibiotic resistance and encourage the community of practitioners to be more cautious in prescribing [3,4]. In this context, several medical professionals have started studies on the use of antibiotics. In endodontics, studies have focused on general practitioners in several countries [5–8]. The results of these studies showed that very few practitioners use antibiotics appropriately in the management of pulpal and periapical pathologies [9–12.] The analysis of the literature shows that very few studies have focused on the attitudes and practices of students in clinical training. In this topic, according to

the drug regimen Mohanty et al [13] reported that 30.85% of the postgraduate students of endodontics prescribed pretreatment medication, as compared to 62.40% of the endodontists who preferred medication for both. European training program guidelines state that graduate practitioners should be sufficiently trained in the basic and clinical science of endodontics. They specify that students must not only have knowledge of the microbiology of pathologies of endodontic origin but also be competent to manage these pathologies. This management integrates infection control, pharmacology, and endodontic therapy.

In Morocco, the book of educational standards for dental studies mentions that the dental student should know the use of antibiotics in the management of microbial infections, the mechanisms of action, and the issues related to antibiotic resistance. They must also be able to perform simple root canal treatments. In the clinical program, students learn to apply their knowledge of antibiotics to the management of infectious dental diseases. At the end of the course, they must know the indications and contraindications for the use of antibiotics in endodontics.

Despite these guidelines in training programs, studies carried out among students in training in Spain reveal a lack of knowledge and inappropriate treatment regimens. They also show a real need to improve knowledge in the prescription of antibiotics [14].

In Morocco, no study has yet analyzed the practices of students concerning the use of antibiotics during endodontic treatments.

The objective of this present study was to assess the level of knowledge and prescription attitudes of students in the management of pulpal and periapical pathologies.

2. Materials and methods:

This is a cross-sectional descriptive survey, conducted from November 2021 to February 2022. The study was approved by the ethics committee of the University Clinic of Dental Medicine of the International Faculty of the International University of Rabat CUMD/ FIMD 03 /22. This study was conducted among all dental students enrolled from the 4th to the 6th year in Morocco. A self-administered questionnaire based on models from previous studies was used [6–12]. This questionnaire has three parts:

The first part includes the socio-demographic data of the students: gender, level of study, and faculty of dental medicine of origin. The second part is related to the types of antibiotics

prescribed during endodontic treatment in an adult patient with or without an allergy to penicillins and the duration of the prescription of these antibiotics. The third and last part deals with clinical situations in which antibiotics are systematically prescribed.

This questionnaire was sent via online and email address; a reminder was sent every 15 days. Data were collected and analyzed with Jamovi version 1.8.1 software. X² and ANOVA tests were performed to compare qualitative and quantitative variables. The significance level was set at $P < 0.05$.

3. Results

For this study, 365 students responded; 71.9% were female and 28.1% were male, which gives a sex ratio of 2.49 in favor of women. 6th year students were more represented with a percentage of 48% (169 students), then 5th year 28.7% (101 students), and lastly 4th year with a number of 82 students (23.3%). The International University of Rabat was the faculty that participated the most in this study, with a percentage of 39.9% $n = 144$, then in second place the Abulcassis University of Health Sciences with a percentage of 19.9% $n = 72$, and the UM6SS with a percentage more or less equivalent to that of Abulcassis (19.7% $n = 71$). The public faculty of Rabat was represented with a percentage of 11.1% $n = 40$, and that of Casablanca had a percentage of 7.8% $n = 28$ (Figure 1).

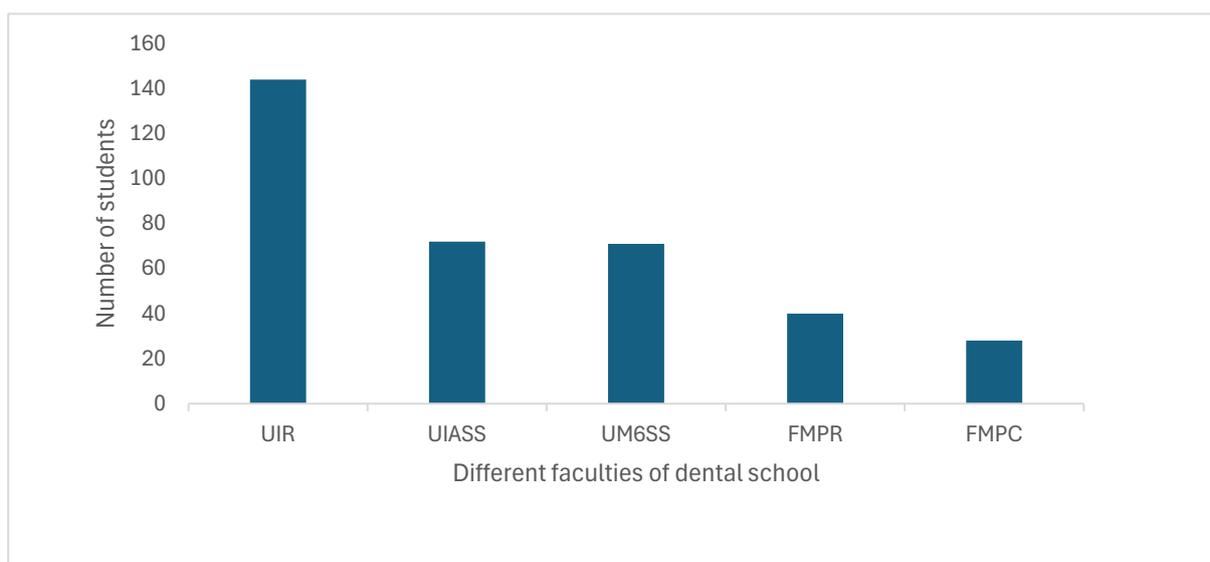


Figure 1. Distribution of the students according to the faculties of dental medicine .

The average duration was 5.87 ± 1.45 days, with a maximum of 7 days for 56.5% of the students and a minimum of 3 days for 14% of the students. No statistical difference was found between the different universities ($p > 0.05$).

3.1. In a patient without a penicillin allergy

Most of the students, 83.8%, prescribe amoxicillin as their first intention, and more precisely, the 1g form of amoxicillin, which is the most prescribed. Amoxicillin associated with clavulanic acid is prescribed by 9.2%, azithromycin is proposed by 2.5% of students, and clindamycin by 1.4%. Concerning the prescription of Metronidazole associated with Spiramycin, we note a prescription percentage of 3.1%.

3.2. In a patient with a penicillin allergy

Concerning patients with an allergy to penicillin, clindamycin was the most prescribed molecule (53.9%), followed by azitromycin (20.9%). Erythromycin was indicated in 7.8% and metronidazole combined with spiramycin in 17.4%.

3.3. Endodontic pathologies with antibiotic prescription

Antibiotics are prescribed for all pulp and periapical pathologies, whether acute or chronic (Table 1). For acute reversible and irreversible pulpitis, antibiotic prescriptions were more indicated by 4th grade students than by students in higher years. In cases of acute reversible pulpitis 21, 2% of 4th grade students prescribed antibiotics, compared to 9.9% of 5th grade students and 2.9% in 6th grade. This difference was statistically significant ($P = 0.01$).

Table 1. Distribution of students who prescribe antibiotics according to endodontic pathologies.

N=number of prescriptions %= percentage	4th	5th	6th	P
	N (%)	N (%)	N (%)	
Reversible acute pulpitis	17 (21.2)	10 (9.9)	5 (2.9)	0.01*
Irreversible acute pulpitis	14 (17.5)	8 (7.9)	11 (6.5)	0.06
Acute apical periodontitis	11 (13.7)	20 (19.8)	31 (18.4)	0.49
Chronic apical periodontitis	13 (16.2)	15 (14.8)	25 (14.8)	0.9
Apical periodontitis with fistula	32 (40)	43 (42.5)	80 (47.6)	0.67
Acute apical abscess	53 (66.2)	74 (73.2)	134 (79.7)	0.13

Pulp necrosis	11(13.7)	6 (5.9)	5 (2.9)	0.005*
Endodontic retreatment	11 (13.7)	4 (3.6)	10 (5.9)	0.03*
Endodontic surgery	31 (38.7)	48 (47.5)	88 (52.3)	0.11
Post op pain	16 (20)	16 (15.8)	25 (14.8)	0.47

*significant N = number of prescriptions % = percentage.

For periapical pathologies, antibiotics were more indicated for acute apical abscesses, with percentages reaching 76.6%. No statistically significant difference was noted between study levels. Regarding pain following endodontic treatment, antibiotic prescriptions were recommended by 20% of 4th year students, 15.8% for 5th year students, and 14.8% for 6th year students; this difference was not statistically significant. However, a statistically significant

difference was noted regarding the prescriptions of antibiotics in situations such as pulp necrosis and endodontic retreatment: 4th year students prescribed more than the other levels.

The analysis of the results according to the different universities shows statistically significant differences concerning the prescription of antibiotics for acute apical abscess, acute apical periodontitis, and endodontic surgery (Table 2).

Table 2. Distribution of students who prescribe antibiotics for endodontic pathologies according to university.

	UIR N=142	UIASS N=72	UM6SS N=70	FMPC N=28	FMPR N=40	P
	N (%)	N(%)	N (%)	N (%)	N (%)	
Reversible pulpitis	20 (14)	2 (2.7)	7 (10%)	0	3 (7.5)	0.32
Acute pulpitis irreversible	11 (7.7)	7 (9.7)	12 (17.1)	0	1 (2.5)	0.47
Acute apical periodontitis	14 (9.8)	12 (16.6)	13 (18.5)	8 (28.5)	7 (17.5)	0.03 *
Apical periodontitis with fistula	58 (40.8)	30 (41.6)	38 (54.2)	18 (64.2)	16 (40)	0.11
Acute apical abscess	95 (66.9)	56 (77.7)	55 (78.5)	26 (92.8)	33 (82.5)	0.02*
Phoenix abscess	53 (37.3)	28 (38.8)	30 (42.8)	18 (64.2)	19 (47.5)	0.03*
Pulp necrosis	11 (7.7)	2 (2.7)	5 (7.1)	2 (7.1)	1 (2.5)	0.43
Endodontic retreatment	8 (5.6)	7 (9.7)	6 (8.5)	2 (7.1)	2 (5%)	0.8
Endodontic surgery:	52 (36.6)	41 (56.9)	44 (62.8)	16 (51.1)	15 (37.5)	0.004*
Post op pain	2014)	13 (18)	16 (22.8)	6 (21.4)	3 (7.5)	0.6

*significant N = number of prescriptions % = percentage.

The percentage of students who prescribed antibiotics in the situation of apical periodontitis was significantly high at the public faculty of Casablanca (28.5%), compared to the other faculties (UM6SS, 18.5%), Rabat, 17.5%, and UIR, 9.8%, $P = 0.03$.

For the acute apical abscess, the prescription of antibiotics was also higher among the students of the public faculty of Casablanca (92.8%) than in the other faculties ($P = 0.02$).

4. Discussion

This study deals with the knowledge and practices of students concerning the use of antibiotics during the management of pulpal and periapical pathologies. The questionnaire used in this study was proposed in previous studies carried out in several counties [12,14,15].

The sample consisted of 365 students from 5 faculties of dentistry in Morocco. 3 faculties in Rabat : International University of Rabat (UIR), Abulcasis University of Health Science (UASS), Public University of Rabat (FMDPR), and 2 faculties in Casablanca: Mohammed 6 University of Health Science (UM6SS), Public Faculty of Casablanca (FMDPC).

It is fairly representative because within the average percentage of participation recorded in similar studies [15,16], the number of women was higher (71.9%). This difference was also noted in Spain, which shows a feminization of the profession. The prescription period of 5.87 ± 1.45 days noted is in line with the recommendations because endodontic infections always regress within 3 to 7 days if the infectious cause is eliminated [17]. In front of patients without allergy to penicillins, Amoxicillin is the molecule of choice for students 83.8% then comes the association of amoxicillin clavulanic acid 9.2%. These results corroborate the data found in the study by khalloufi et al, carried out among practitioners in northern Morocco [15]. They are also comparable to those noted in other European countries [16] and African [18].

In India, practitioners also prefer amoxicillin as their first choice, followed by oxofloxacin. Amoxicillin is an effective antibiotic for the germs implicated in periapical pathologies.

However, in the event of inefficiency linked to the production of β - lactamase, the combination of amoxicillin with clavulanic acid can be proposed. According to scientific societies, this combination should be considered a second-line treatment in the event of failure with amoxicillin or in patients with understood immunity [1]. In patients with penicillin allergy, clindamycin was the most prescribed molecule (53.9%), followed by azithromycin (20.9%). Erythromycin was indicated in 7.8%, metronidazole combined with spiramycin in 17.4%. The study by Bolfini et al shows results identical to this study, where clindamycin is the most prescribed antibiotic at 33%. The work of Rodriguez Nunez et al. [19] also found clindamycin in first place at 69% and azithromycin at 29.2%. This while Al Khuzaei et al [7], in a study carried out with dental surgeons, found different results, with azithromycin being at the top of the line with 63.2%. Metronidazole occupies the 3rd place in this present study, It is an anti-infective effective against bacteria with black pigmentation but less effective on aerobes or facultative anaerobes, which makes it more advisable to combine it with another antibiotic such as amoxicillin or spiramycin. Its association with amoxicillin should not be systematic but dictated by the evolution of the pathology; If, two to three days after the prescription of amoxicillin alone, there is no favorable evolution, metronidazole can be added to amoxicillin. In Spain, 99% of students chose clindamycin. The same study carried out among endodontists and general practitioners found different results (63% and 65% for clindamycin, respectively).

Regarding the indications of antibiotics as an adjuvant to endodontic treatment, several studies carried out in different countries showed a lack of knowledge on indications and inappropriate use of antibiotics. In this study, the percentage of students who prescribe antibiotics is relatively high. The results show that 9.1% of students prescribe antibiotics for acute pulpitis. A similar study carried out among students in Spain showed higher results (29%) for pulpitis and (63%) for beginning acute apical periodontitis [14]. However, these pathologies are dominated by pulpal inflammation; no trace of infection is noted in the pulp. Their management, therefore, does not require the use of antibiotics.

In the chronic apical periodontitis 15.4% of students prescribe antibiotics. These results are similar to those found in Spain with 16% [14]. The decrease in the percentage could be mainly related to their chronic asymptomatic nature. However, compared to the results obtained with practitioners, the percentages are higher, 31% in Spain and 51.2% in Morocco [15].

These results show the need for continuous training for general practitioners.

In the case of retreatment the Moroccan students as most dentists in India, preferred prescription of antibiotics only in specific cases [20,21]. Otherwise, the use of solvent during the root canal retreatment does not cause any significant difference in the post-operative pain levels or medication intake for retrieval of Gutta percha [22].

Concerning postoperative pain antibiotics were prescribed by dental students with a rate from 7.5% to 22.8% according to dental school. Therefore, Jose and al [23] concluded that oral consumption of corticosteroids as a better analgesic in this cases.

For acute apical abscess 76.6% of students prescribe antibiotics. In Spain [5,19] it is almost systematic 90%. In fact, the prescription of an antibiotic should only be indicated if there are associated general signs.

5. Conclusion

The results of the present study show that despite the existence of pharmacology and endodontics modules in the study curricula, the various faculties of dentistry should integrate new teaching methods to improve students' knowledge of antibiotics and their indications in endodontics. They must develop innovative interactive teaching based on real cases, electronic educational tools offering access to precise information and standardized educational materials for prudent antibiotic therapy. The curriculum for dental studies should place more emphasis on prescribing and the teaching of good practice.

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Conflicts of Interest: The authors deny any conflicts of interest related to this study.

Ethics approval: The study was conducted following the Declaration of Helsinki, and approved by The Research Ethics Board of the International Faculty of Dental Medicine of Rabat - International University of Rabat Ref: CUMD/FIMD 003/20/22/Approval/2019.

Consent to participate: Informed consent was obtained from each author.

Data availability: ok

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