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Original Research Article

Prescription of antibiotics during endodontic treatments: Survey of senegalese dentists

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ABSTRACT

Introduction: Irrational antibiotic prescribing is a phenomenon common to several countries, including Senegal.

The aim of this study was to assess the level of antibiotic prescribing among Senegalese dental surgeons during the management of pulpal and periapical pathologies.

Materials and Methods: This descriptive, analytical, cross-sectional study involved 132 dentists regularly registered with the Senegalese Dental Surgeons' Association.

Data were collected and analyzed using SPSS version 17.0 software (SPSS, Inc., Chicago, IL, USA).

The results of X2 tests showed a statistically significant difference between the private and public sectors for the management of root resorption ($P \leq 0.005$).

Results: In patients with penicillin allergy, clindamycin was the first-line treatment (31.1%), followed by metronidazole combined with spiramycin (25%) and azithromycin 500mg (22.7%).

Conclusion: As with previous studies carried out in other countries, this study shows that very few practitioners make appropriate use of antibiotics for pulpal and periapical pathologies.

1. Introduction

Antibiotics are widely used by healthcare professionals to treat or prevent bacterial, parasitic, viral and fungal infections. Currently, due to their overuse, there is a growing global threat to the efficacy of these agents against mostly resistant microorganisms. The Lancet Commission on Infectious Diseases has published a series of articles on antibiotic resistance to encourage more prudent use.[1] In oral health, antibiotics are used both to treat infections and to prevent them before, during or after treatment. In healthy individuals, bacteremia generated by endodontic treatment recovers rapidly and causes no complications.[2]

Endocanal treatment is based on the elimination of bacteria and their by-products through complete debridement of the root canal system, in order to reduce infection and curb induced inflammation.[3] In most cases, the patient's condition improves once the source of infection has been eliminated. In endodontics, antibiotics are used as an adjunct to treatment in only certain pathological situations. According to the European Society of Endodontics,[3] the use of antibiotics during endodontic treatment requires the infection to be persistent or systemic in nature. Pain alone or localized congestion is not an indication for systemic antibiotic treatment.[3]

To ensure rational use of antibiotics in endodontics, the European Society of Endodontics organized a consensus conference in 2006 and 2017 to codify the use of

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antibiotics. Since then, systemic antibiotic treatment has only been indicated in the following endodontic pathological situations:[3–5]

1. Acute apical abscess in medically compromised patients (patients at risk).
2. Acute apical abscess with systemic involvement (localized swelling, fever > 38°C, malaise, lymphadenopathy, trismus).
3. Progressive infections (rapid onset of severe infection <24 h, cellulitis).
4. Reimplantation of expelled permanent teeth.

Antibiotics are therefore not routinely prescribed during endodontic treatment. Over-use of antibiotics could lead to antibiotic resistance in the long term, with consequences such as increased cost and treatment time, and medical complications that could lead to therapeutic ineffectiveness. The scale of the problem has prompted some authors to study the rational use of antibiotics in dental treatment.

Antibiotic prescription in endodontics has been the subject of several studies. The results of previous studies carried out in several countries show that fewer than 1/3 of practitioners make efficient use of antibiotics for pulpal and periapical pathologies. More specifically, they also reveal a real lack of knowledge regarding indications, doses and treatment times.

In view of this, and following the example of other countries, this study was carried out among dental surgeons practising in Senegal, with the aim of assessing the use of antibiotics in relation to pulpal and periapical pathologies.

2. Materials and Methods

This was a descriptive cross-sectional analytical survey, conducted from November 2017 to February 2018. The sample consisted of dental surgeons registered in 2017 (n=255) with the Ordre National des Chirurgiens-Dentistes du Sénégal (ONCDS). To be included in the study, they had to:

1. Have a doctorate in dental surgery and be regularly enrolled in either Table A or Table B of the Ordre National des Chirurgiens-Dentistes du Sénégal (ONCDS);
2. Dental surgery in Senegal;
3. Be available and willing to participate in the study.

A self-administered questionnaire based on models from previous studies[6–10] was used. It is presented in the form of a questionnaire and meets a number of criteria, such as the use of closed questions as much as possible, the use of a clear universal vocabulary, and the use of short, simple questions, without negation and developing only one idea. It consists of three parts:

The first part focused on the practitioners' socio-demographic data (age, gender, sector of activity, experience in endodontic practice and specialization in endodontics).

The second part related to the types of antibiotics used for endodontic treatment in adult patients with and without penicillin allergy.

The third and final section deals with endodontic pathological situations where antibiotics are prescribed.

The questionnaires were handed out at random to practitioners at a scientific congress held in Dakar in mid-November, and in their respective practices. Questionnaires were collected within 2 weeks of submission. Confidentiality and anonymity were respected, as no information could be used to identify participants.

Data were collected and analyzed using SPSS version 17.0 software (SPSS, Inc., Chicago, IL, USA). Quantitative data were expressed as mean and standard deviation, qualitative data as number and proportion.

The X_2 and Fisher tests were used to compare variables. The significance level was set at $P < 0.05$.

3. Results

A total of 194 questionnaires were submitted to dentists registered with the Ordre national order of dental surgeons of senegal (NODSS). At the end of the survey, 132 completed questionnaires were recovered, corresponding to a response rate of 68%.

The sample was predominantly made up of male practitioners (65.9%) versus 45 females (34.1%). This gave a sex ratio of 1.9.

The average age was 46.36±11.03 years, with a minimum of 24 and a maximum of 67. Age distribution showed a more or less even spread, with 35.6% aged between 25 and 35, 33.3% over 45 and 31.1% aged between 36 and 45.

The private sector was more represented, with a percentage of 56.8% (n=75). With regard to specialization, only 16 practitioners declared having received post-graduate training in endodontics, and 9 of these were in private practice.

Most dentists 119 (90.2%) prescribe amoxicillin as first-line treatment, more specifically the 1g dose (61.4%).

Amoxicillin combined with clavulanic acid in its 1g form was chosen as second-line treatment by 75% of practitioners, followed by metronidazole (47%) as third-line treatment. Other molecules such as metronidazole combined with spiramycin, azithromycin, clarithromycin, ciprofloxacin, tetracyclines and clindamycin were rarely prescribed.

For metronidazole, the 500mg form is the most prescribed (92%).

Antibiotic prescribing for patients with no penicillin allergy shows no statistically significant difference according to sector of activity (p< 0.083) or age group (p<

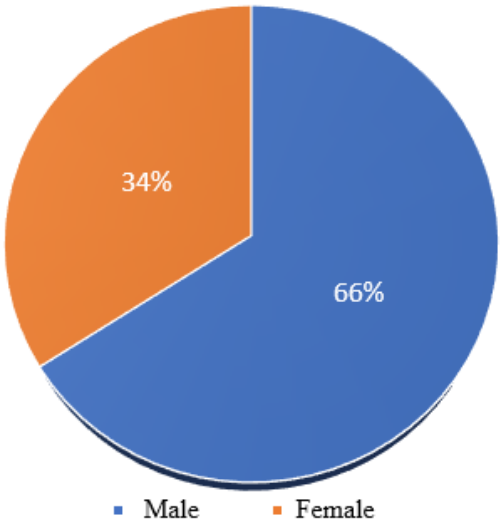

Figure 1:

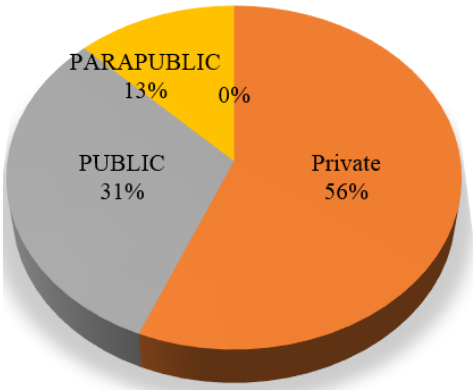

Figure 2:

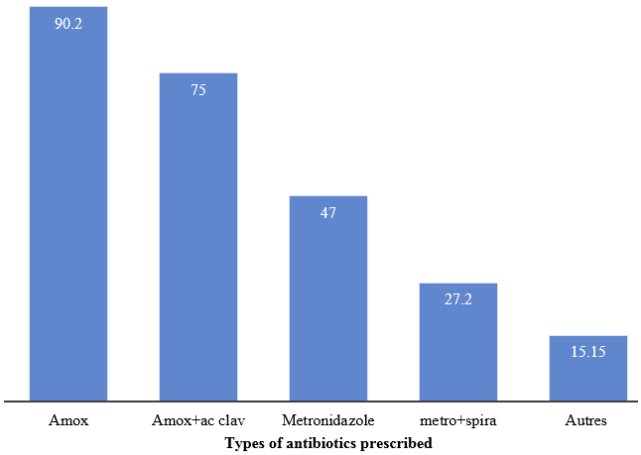

Figure 3:

0.067).

The average duration of antibiotic prescriptions was 7 days ±2.08, with a minimum of 3 days and a maximum of 15 days.

Prescription duration was the same for all sectors of activity and age groups, and no statistically significant differences were noted.

Antibiotics were almost systematically prescribed to treat pulpal and periapical pathologies, postoperative pain following endodontic treatment and oral trauma.

Table 1: Antibiotic prescriptions by endodontic pathology.

Endodontic pathologies	Practitioners	
	N	%
Acute reversible pulpitis	2	1,5
Acute irreversible pulpitis	10	7,5
Pulpodesmodontitis	56	42,4
Simple acute apical periodontitis	74	56
Acute apical abscess	121	91,7
Phoenix abscess	115	87
Pulpal necrosis	51	38,6
Chronic apical periodontitis	78	59
Pulpal necrosis with fistula	103	78
Post-op	44	33,3
Endodontic treatment	48	36,3
Apical resection	119	90,1
Root perforation	69	52,2
Horizontal fracture	34	25,7

Antibiotics were prescribed for vital pulp pathologies (acute reversible pulpitis and acute irreversible pulpitis) at 1.5% and 7.5% respectively. These prescriptions were mainly made by practitioners under 35 years of age, working in the public sector and with no additional training in endodontics.

For pulpal necrosis, 38.6% of practitioners included antibiotics in their treatment.

However, there were no significant statistical differences according to sector of activity or age group (P=0.69).

One hundred and twenty-one practitioners (91.7%) prescribe antibiotics for the management of acute apical abscess, 87% for phœnix abscess and 56% for simple acute apical periodontitis (Table 1).

Antibiotic prescribing shows no statistically significant or relative difference with sector of activity or seniority (Table 2 and Table 3).

For the chronic line, 78% of antibiotic prescriptions were for apical fistulized periodontitis and 59% for chronic apical periodontitis (Table 1).

No statistically significant differences were noted in relation to seniority or sector of activity. On the other hand, there was a high level of prescriptions for chronic apical periodontitis among non-specialists (63.7% vs. 37.5%) (P=0.04) (Table 2).

Table 2: Antibiotic prescriptions by age group.

	25-35 years N (%)	36-45 years N (%)	Age range < 45 years old N (%)	Total	P
P.A.R	2(4,2)	0	0	2(1,5)	0,16
P.A.I	4(8,5)	2(4,9)	4(9)	10(7,5)	0,73
Pulpodesmodontitis	19(40,4)	20(48,7)	17(38,6)	56(42,4)	0,59
Simple acute apical periodontitis	25(53,2)	25(61)	24(54,5)	74(56)	0,72
Acute apical abscess	44(94)	38(92,7)	39(88,6)	121(91,7)	0,58
Phoenix abscess	42(89)	38(92,7)	35(79,5)	115(87)	0,11
Pulpal necrosis	18(38)	14(34)	19(43)	51(38,6)	0,69
Chronic apical periodontitis	30(63,8)	24(58,5)	24(54,5)	78(59)	0,66
Pulpal necrosis with fistula	38(80,8)	33(80,4)	32(72,7)	103(78)	0,55
Post-op	19(40,4)	13(31,7)	12(27,2)	44(33,3)	0,39
RTE	18(38,3)	21(51,2)	9(20,4)	48(36,3)	0,011 *
Apical resection	41(87)	38(92,7)	40(90,9)	119(90,1)	0,58
P.R	20(42,5)	28(68,3)	21(47,7)	69(52,2)	0,037 *

A.R.P.: Acute Reversible Pulpitis
A.I.P.: Acute irreversible pulpitis
RTE: Endodontic treatment
R: Root perforation
* : Statistically significant difference

Antibiotics were also prescribed respectively in the treatment of postoperative pain (33.3%), endodontic retreatment (36.3%), endodontic surgery (90.1%) and root perforation (52.2%). More prescriptions were made by private practitioners than by public practitioners (P≤0.05) (Table 2 and Table 3).

In traumatology, antibiotics were also associated with the management of 75% of reimplantations, 46% of dislocations, 57.6% of extrusions, 59% of intrusions and 29.5% of horizontal fractures.

Apart from reimplantation, where antibiotic prescribing shows no statistically significant difference according to sector of activity, private practitioners prescribe more than public practitioners (P≤0.05). (Table 4)

4. Discussion

The present study was carried out among dental surgeons, regularly registered with the Ordre National des Chirurgiens-Dentistes du Sénégal (ONCDS) in 2017.

Out of 194 questionnaires submitted, 132 were fully completed, corresponding to a response rate of 68%. This rate is acceptable, as it is in line with the average return rate obtained in this type of study. Similar studies have been carried out in India.[11] Turkey,[12] Spain[5] and Iran,[13] with response rates ranging from 4% to 60%.

The majority of practitioners surveyed, 90.2%, prescribe amoxicillin as first-line treatment, followed by amoxicillin combined with clavulanic acid in second place, with 75% of practitioners prescribing it for patients with no allergy to penicillins. This result is close to that of Al Khzei,[14] which is 92.5%, but also to the results of Segura-Egea in Spain,[5] 95% for prescribing amoxicillin.

Amoxicillin is a medium-spectrum bactericidal β-lactam. It is also an effective anti-infective against gram-negative bacteria. However, its action can be inhibited by β-lactamase-producing bacteria.

Consequently, in certain infections, β-lactams must be combined with a β-lactamase inhibitor such as clavulanic acid.[3]

The combination of amoxicillin and clavulanic acid is therefore the antibiotic of choice for odontological infections, thanks to its broad spectrum, pharmacological profile and low level of antibiotic resistance.

In this study, 75% of practitioners prescribed amoxicillin combined with clavulanic acid, while in Spain[5] it was the antibiotic most prescribed by dentists (61%). In South Africa[7], amoxicillin is also the antibiotic of choice for endodontic infections.

Iqbal[1] in Saudi Arabia shows that the amoxicillin/clavulanic acid combination came out on top with 45.2%.

For patients with penicillin allergy, clindamycin is the antibiotic of choice at 31.1%, followed by spiramycin combined with metronidazole at 25% and azithromycin at 22.7%. The results of a survey of dentists by Al Khuzaei et al[14] differ from those of the present study, with azithromycin leading the way at 63.2%, followed by doxycycline at 25.4%.

The study by Bolfini et al[6] corroborates the results of the present study, with clindamycin the most prescribed antibiotic at 33%. The work of Rodriguez Nunez et al[15] also finds clindamycin in first place with 69% and azithromycin at 29.2%. Other antibiotics prescribed include erythromycin 12.1%, lincomycin 3.8% and vancomycin 1.8%.

Table 3: Antibiotic prescriptions by sector of activity.

	Sector of activity				
	Private	**Public**	**Parapublic**	**Total**	**P**
	N (%)	**N (%)**	**N (%)**	**N**	
Acute reversible pulpitis	0	2(4,2)	0	2	0,15
Acute irreversible pulpitis	5(6,6)	5(10,6)	0	10	0,43
Pulpodesmodontitis	37(49,3)	16(34)	3 (30)	56	0,20
Simple acute apical periodontitis	41(54,6)	27(57)	6(60)	74	0,87
Acute apical abscess	70(93,3)	41(87)	10(100)	121	0,52
Phoenix abscess	68(90,6)	38(80,8)	9(90)	115	0,44
Pulpal necrosis	28(37,3)	20(42,5)	3(30)	51	0,63
Chronic apical periodontitis	44(58,6)	27(57,4)	7(70)	78	0,81
Pulpal necrosis with fistula	62(82,7)	32(68)	9(90)	103	0,17
Post-op	31(41,3)	13(27,6)	0	44	0,021 *
Endodontic treatment	35(46,7)	12(25,5)	1(10)	48	0,014 *
Apical resection	71(94,7)	38(80,8)	10(100)	119	0,048 *
Root perforation	48(64)	19(40,4)	2(20)	69	0,005 *

Table 4: Antibiotic prescriptions in traumatology.

Endodontic pathologies	**Practitioners**	
	N	**%**
Horizontal fracture	34	25,7
Reimplantation following trauma	99	75
Luxation	61	46
Extrusion	76	57,6
Intrusion	78	59

Metronidazole is an effective anti-infective against anaerobes, but is less effective against aerobes or facultative anaerobes, so it is wiser to combine it with another anti-infective such as amoxicillin or spiramycin.

Its association with amoxicillin should not be systematic, but dictated by the evolution of the pathology. If, two or three days after the prescription of amoxicillin alone, there is no favorable evolution, metronidazole can be added to amoxicillin.

Acute oral infections progress relatively quickly, between 2 and 7 days if the infectious cause is eliminated.

The practitioners surveyed in this study (36.36%) prescribed antibiotics for an average of 7 days ±2.08. In Brazil,[6] endodontists prescribe for a similar period of 7 days.

The average duration varies from 4.18 to 7.58 days in the literature.

The ideal duration of antibiotic treatment is the shortest that can prevent both clinical and microbiological aspects at the same time.

Depending on age and sector of activity, there is no difference in prescription duration. A short course of antibiotics reduces the risk of antibiotic-induced toxicity and allergy, as well as the risk of resistance.

The use of broad-spectrum antibiotics, which include several species, can increase the risk of resistance. When local treatment, i.e. the surgical procedure, is optimal and effective, antibiotics should not be prescribed for more than 7 days. Prolonged use of antibiotics, or prescribing low doses of broad-spectrum antibiotics, increases the risk of antibiotic resistance.

In acute reversible pulpitis, irreversible pulpitis and pulpodesmodontitis, where the pulp is still vital, there is no infection and no signs or symptoms of systemic evolution, so antibiotics are not indicated.[3,16] Furthermore, the use of antibiotics in these conditions does not reduce pain. However, in this study, 1.5% of practitioners still prescribed antibiotics for acute reversible pulpitis, 7.5% for acute irreversible pulpitis and 42.4% for pulpodesmodontitis.

Results for pulpodesmodontitis are in line with the average found in the literature: 6.2% for Brazilian endodontists,[6] 82.6% for Iranians,[13] 71.6% for Indians.[11] In pulp pathologies dominated by inflammatory pain, Najla's work in 2000[17] showed that antibiotics had no effect on reducing painful symptoms, which are managed by taking analgesics.

Chronic apical periodontitis, pulpal necrosis and chronic fistulized apical periodontitis are chronic pathologies whose treatment relies solely on root canal debridement without the use of antibiotics.[3,16] Nevertheless, in the present study, prescription levels of 59% were found for chronic apical periodontitis, 38.6% for pulpal necrosis and 78% for fistulized chronic apical periodontitis.

Studies of endodontic specialists in Brazil and the USA report lower rates of 20.58% and 11.2% respectively.[6,10]

In contrast, results obtained from general dentists in Spain show high rates (59.8%) of antibiotic prescriptions.[3,16]

In the case of acute apical periodontitis: acute apical abscess or phœnix abscess without associated general signs following endodontic treatment, the host's defences are sufficient to control the infection.

However, if the patient's general condition is compromised, or if there is a risk of the infection spreading, antibiotics may be prescribed.

The majority of respondents (90-100%) prescribe antibiotics in these situations. This attitude is in line with the latest recommendations of scientific societies in endodontics.[16]

In traumatology, antibiotic prescription was only indicated in the case of reimplantation; other situations did not justify antibiotic prescription.

For reimplantation, only 80.8% of practitioners prescribe antibiotics, with no statistical difference according to age or sector of activity.

The results of this study show that very few practitioners make appropriate use of antibiotics for pulpal and periapical pathologies. There is also a real lack of knowledge regarding indications, doses and treatment times.

5. Conclusion

As with previous studies carried out in other countries, this study shows that very few practitioners make appropriate use of antibiotics for pulpal and periapical pathologies.

In addition, there was a real lack of knowledge regarding indications, dosages and durations.

So it's important not only for dentists but also for other general practitioners to reserve antibiotics for truly severe infections.

The use of antibiotics for minor cases or in unwarranted patients contributes to the increase in antibiotic resistance problems.

6. Source of Funding

None.

7. Conflict of Interest

None.

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