

Association between clinical experience and antibiotic prescription by dentists in cardiac disease patients undergoing root canal treatment

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ABSTRACT

Background: The microorganism present in the oral cavity have been reported previously to cause opportunistic infections in cardiac disease patients. This is the reason why antibiotic prophylaxis is considered very essential for these patients before undergoing dental treatment. The objective of the study is to find the association between clinical experience of dental practitioners and use of antibiotic prescription in cardiac disease patients undergoing root canal treatment.

Methodology: A cross-sectional study was conducted on 100 dentists in Sharif Medical and Dental college, Lahore over a period of one year. Data was collected through a questionnaire that collected information on trends of antibiotic prescription of dentists for cardiac disease patients (Infective Endocarditis patients, Myocardial Infarction patients and prosthetic heart valve patients) undergoing root canal treatment. All dental practitioners working in clinical sciences irrespective of their age and gender were included in the study. Those with a clinical experience of less than 6 months were excluded from the study.

Results: A statistically non-significant association between clinical experience and antibiotic prescription trends of among dental practitioners for myocardial infarction patients ($p=0.265$), Infective Endocarditis patients ($p=0.119$), Prosthetic heart valves ($p=0.062$) undergoing root canal treatment.

Conclusion: Dental practitioners with experience of more than 3 years tended to prescribe antibiotics to high-risk patients more than those with a lesser clinical experience.

Keywords: Antibiotic prescription, Cardiac disease patients, Dental practitioners, Oral infection, Root canal treatment

BACKGROUND

The American Heart Association recommends the use of antibiotics in high-risk cardiac disease patients.¹ These include patients with myocardial infarction, congenital heart disease, prosthetic heart valves, infective endocarditis and cardiac transplant patients.² This antibiotic prophylaxis is used in these high-risk patients when they are undergoing invasive dental treatments.²

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In order to alleviate symptoms of inflammation and pain in the pulpal region caused by root canal infections, surgery is typically necessary rather than a course of systemic antibacterial medications.^{3,4} Systemic adjunct antimicrobial therapy is advised by the European Society of Endodontology (ESE) for acute apical abscesses that are accompanied by fatigue, fever, lymphadenopathy, trismus, and progressing illnesses including cellulitis as well as osteomyelitis.⁵ In light of suggestions coming from the American Heart Association (AHA) along with American College of Cardiology (ACC), the American Association of Endodontists (AAE) lately revised their establish declaration on prophylactic use of antibiotics, reaffirming their previous suggestion that patients who are more likely to experience infectious endocarditis ought to receive recommended a course of antibiotics.⁶ Antibiotic prophylaxis in patients with cardiac disease are primarily aimed at preventing Infective Endocarditis(1). While patients with a history of

Myocardial infarction do not require this precautionary measure, antibiotics are prescribed to these patients in order to prevent any infection due the prosthetic heart valves or intracardiac devices they might have.¹ The National Institute of Health & Care Excellence's (NICE) recommendations for prophylactic antibiotics for people at susceptible to acquiring Infective Endocarditis are even more stringent in the United Kingdom.^{7,8} They declared that "individuals having dental treatments should not regularly receive prophylactic antibiotics towards infective endocarditis."⁷ It is generally agreed upon that the use of antibiotics should be restricted to patients who are immunocompromised, have infections that are fast developing, or exhibit systemic symptoms indicative of infection.⁹

Patients with prosthetic heart valves are also at a great risk of development of infective endocarditis.¹ In order to prevent this, antibiotic prophylaxis is used in these patients.¹ This is done in order to prevent bacterial seeding in the material of the prosthesis.¹ Unsuitable prescription trends among dentists worldwide have been brought to light by cross-section observational studies.¹⁰ Only 8.2% of dentists recommended penicillin V for serious dental infections, according to Sweeney *et al.*¹⁰ In the United Kingdom, antimicrobial mixtures accounted for 5.6% of dental medications; amoxicillin and metronidazole⁶ were the most common combination.¹¹ Ten percent of the antimicrobial agents administered in the UK's National Health Service routine dental care in 2016 were written by dentists.¹¹ Different regions of the globe have varied prescribing suggestions for antibiotics.¹² In individuals at an elevated risk for acquiring infectious endocarditis, each the American Heart Association (AAE) alongside the European Society of Cardiology (ESC) advise taking antibiotics before invasive methods dental treatments that include manipulating the gingival or apical tissues as well rupture of the mucosa of the mouth (which includes endodontic treatments).¹² Individuals with severe genetic heart problems, those who have had Infective Endocarditis in the past, those who have artificial heart valves (or prosthesis substance employed in coronary valve repairs), and those who have had heart transplants with regurgitation because of structurally defective valves are all included in this category.¹²

A judicious and appropriate use of antibiotic prophylaxis by dentists in immunocompromised

patients undergoing dental treatment is very crucial to their overall well-being. The clinical experience and practice of dentists impacts greatly their knowledge and practice of antibiotic prescription. There is not an elaborate body of literature that explores this aspect of antibiotic prophylaxis use and its association with clinical experience of the dentists. The aim of our study was to find the association between level of clinical experience of dentists and prescription of antibiotic in cardiac disease patients undergoing root canal treatment.

MATERIAL AND METHODS

After obtaining ethical clearance from the ethical committee (Ref.No. SMDC/SMRC/168-21), a cross-sectional study was conducted on 100 dental practitioners in Sharif Medical and Dental College, Lahore. Sample size of 100 participants was calculated using an online calculator for sample size calculation, Scalex Sp. 1.0.0¹³ and the parameters for sample size were Confidence level 95%, precision 5% and antibiotic prescription trends in dentists 7%.¹⁴ The study design was cross-sectional and sampling technique was convenient sampling. Informed consent was obtained from participants prior to data collection. All dental practitioners working in clinical sciences irrespective of their age and gender were included in the study. Dentists with a clinical experience of less than 6 months were excluded from the study. The study was carried from January 2023 to January 2024. A four-part pre-validated questionnaire was used for data collection. The Cronbach alpha value of the questionnaire was 0.914.¹⁵ The first part collected information on the demographic aspects as well as the designation and years of clinical experience of the dentists. The second part recorded information on trends of antibiotic prescription of dentists for cardiac disease patients (Infective Endocarditis patients, Myocardial Infarction patients and prosthetic heart valve patients) undergoing root canal treatment. Statistical Package for the Social Sciences 23 was used for statistical analysis. p value less than equal to 0.05 was considered significant. Chi square test was used to find the association of antibiotic prescription trends of dentists in cardiac disease patients with their clinical experience.

RESULTS

This study included a total of 100 dental practitioners with a mean age of 27.29±5.45 years. Majority of the participants were female (67%) and 33% were males.

Table I shows a statistically non-significant association between clinical experience and antibiotic prescription trends of among dental practitioners for myocardial infarction patients undergoing root canal treatment ($p=0.265$). It was seen that a higher percentage of dentists (40%) with more clinical experience (>3 years) prescribed antibiotics before a root canal treatment of MI patients as compared to those with experience of 2-3 years (28%) or 6-12 months (32%) as shown in table-I.

Table-II shows a statistically non-significant association between clinical experience and antibiotic prescription trends among dental practitioners for patients with

Infective Endocarditis undergoing root canal treatment ($p=0.119$). Majority of dentists (39.7%) with a clinical experience of > 3 years prescribed antibiotics before a root canal treatment of infective endocarditis patients as compared to those with an experience of 2-3 years (28.8%) as shown in table-II.

Table-III shows a statistically non-significant association between clinical experience and antibiotic prescription trends among dental practitioners for patients with Prosthetic heart valves undergoing root canal treatment ($p=0.062$). It was seen that a higher percentage of dentists (42%) with a clinical experience of >3 years prescribed antibiotics before the root canal treatment of prosthetic heart valve patients as compared to those with an experience of 6-12 months (30%) and 2-3 years (28%) as shown in table-III.

Table-I: Antibiotic prescription trends for patients with myocardial infarction undergoing root canal treatment

Antibiotics for RCT in patients with myocardial infarction	Clinical experience			Total (n=100)	p-value
	6-12 months (n=33)	2-3 years (n=33)	>3 years (n=34)		
Yes	19 (32%)	17 (28%)	24 (40%)	60 (100%)	0.265
No	14 (35%)	16 (40%)	10 (25%)	40 (100%)	

Table-II: Antibiotic prescription trends for patients with infective endocarditis undergoing root canal treatment

Antibiotics prescription trends for patients with infective endocarditis undergoing root canal treatment	Clinical experience			Total (n=100)	p value
	6-12 months (n=33)	2-3 years (n=33)	>3 years (n=34)		
Yes	23 (31.5%)	21 (28.8%)	29 (39.7%)	73 (100%)	0.119
No	10 (37%)	12 (44%)	5 (18.5%)	27 (100%)	

Table-III: Antibiotic prescription trends for patients with prosthetic heart valves undergoing root canal treatment

Antibiotics prescription trends in patients with prosthetic heart valves undergoing root canal treatment	Clinical experience			Total (n=100)	p value
	6-12 months (n=33)	2-3 years (n=33)	>3 years (n=34)		
Yes	20 (30%)	19 (28%)	28 (42%)	67 (100%)	0.062
No	13 (39%)	14 (42%)	6 (18%)	33 (100%)	

DISCUSSION

Antibiotic prophylaxis before dental treatment has shown to be very helpful in reducing post-operative infections in immunocompromised patients.^{16,17} Our study explored the trends of antibiotic prescription among dentists with different levels of clinical experience while treating patients with myocardial infarction (MI), infective endocarditis (IE), and prosthetic heart valves—undergoing root canal treatment (RCT). No significant associations between the two were seen but the study revealed noticeable trends.

Our study reported that for patients with infective endocarditis, 39.7% of the most experienced dentists prescribed antibiotics, compared to 31.5% and 28.8% among those with less experience ($p=0.119$). This indicated a very cautious approach toward this medically compromised group. The American Heart Association (AHA) guidelines include the prophylactic prescription of antibiotics in IE patients. According to one study, majority of the dentists prescribed antibiotics prophylactically to patients with Infective endocarditis (51.2%) while 44% referred them to a consultant for further consultation.¹⁸ It was also mentioned that the decision of prophylactic antibiotic prescription was not

significantly associated with the clinical experience of dental practitioners.¹⁸ Dentists also preferred giving antibiotics of patients with a history of infective endocarditis (63%).¹⁸ It was seen that most dentists (94.5%) prescribed antibiotics to infective endocarditis patients before surgical tooth extraction followed by periodontal surgery (88.2%) and 46% before root canal treatment.¹⁸ These results are similar to our study where majority of the dentists prescribed antibiotics before dental treatment. Many studies have revealed the dentists to be confused regarding the use of antibiotics in these patients.¹⁹ The current study's lack of statistical significance suggests that despite guideline existence; practitioner discretion remains a dominant factor. A study conducted in Jordan on dental practitioners revealed that the dentists despite restricted recommendation of antibiotic prescription by NICE guidelines, still widely prescribe them for patients with Infective Endocarditis.²⁰ It is evident that clinician's discretion plays the most important role in making the final call.

In our study the trend was most pronounced among prosthetic heart valve patients, with 42% of dentists with >3 years of experience prescribing antibiotics, compared to 30% and 28% in the less experienced groups ($p=0.062$). While the results of our study were not significant, they still highlight the general consensus regarding the importance of antibiotic prophylaxis in these patients. Patients with Prosthetic heart valves are at a high risk of development Infective Endocarditis. Due to this reason majority of the dentists use antibiotic prophylaxis in this patient group.^{21,22} These findings are consistent with our study where most of the experienced dentists prescribed antibiotics to these patients. Studies show that a vast majority of the dentists prescribed antibiotics to patients with prosthetic heart valves before dental treatment.¹⁸ Prosthetic heart valves are considered to be risk factors for infective endocarditis.²³⁻²⁵ A study conducted in Jordan revealed that 87% dental practitioners considered the prescription of antibiotics before and after a dental procedure absolutely necessary for patients with prosthetic heart valves.²⁶ A study carried out on Pakistani dentists revealed that 77% dentists prescribed antibiotic prophylaxis to patients with prosthetic heart valve patients undergoing dental treatment.²⁷ All these studies have results similar to our

study where majority of dentists prescribed antibiotics for patients with prosthetic heart valves.

Our study showed that in the case of myocardial infarction patients, the data showed that more experienced practitioners (>3 years) were more likely to prescribe antibiotics (40%) compared to their less experienced counterparts (32% with 6–12 months of experience and 28% with 2–3 years), although the difference was not statistically significant ($p=0.265$). These findings are similar to those reported by Suda *et al.* (2019)²⁸ it was reported that experienced dentists rely on their own clinical judgement.²⁸ This judgement can be influenced by obsolete clinical practices in addition to unnecessary caution.²⁸ This ultimately leads to an over prescription of antibiotics.²⁸ On the contrary, dentists who have graduated recently and are better read regarding the recent guidelines and protocols tend to discourage unnecessary prescriptions to these patients.²⁸ According to one study, it was seen that 69% dentists prescribed antibiotics before dental procedures to patients who had a history of Myocardial infarction.²⁹ Contrary to the guidelines of American heart association, approximately 42% dentists in the USA considered it essential and prescribed antibiotics to patients with MI undergoing dental treatment.³⁰ A study conducted in Pakistan reported that a vast majority of dentists (77%) considered antibiotic prophylaxis very important for patients with heart conditions like prosthetic heart valves and myocardial infarction.³¹

LIMITATION

This study had a few limitations. Firstly, it was unclear if the dentists who participated in the study had undergone appropriate training regarding antibiotic prescription in cardiac disease patients as this was not explored in the study. Secondly, a larger sample could have yielded more information on the topics under discussion.

CONCLUSION

The results of the present were not statistically significant. The trends reported in this study indicate a strong influence of clinical experience on antibiotic prescribing behavior. Dental practitioners with experience of more than 3 years tended to prescribe antibiotics to high-risk patients more than those with a lesser clinical experience.

This highlights the continued need for uniform dissemination and implementation of evidence-based guidelines to minimize unnecessary antibiotic use and combat antimicrobial resistance.

CONFLICT OF INTEREST

None

GRANT SUPPORT & FINANCIAL DISCLOSURE

Declared none

AUTHOR CONTRIBUTION

Zain Amjad: Literature review and Manuscript write-up, final approval, agreement to be accountable for all aspects of the work

Maria Jabbar: Data Collection, concept and design, Manuscript write-up, statistical analysis critical revision, supervision and final approval, final approval, agreement to be accountable for all aspects of the work

Quratul-Ain Zafar: Literature review and Manuscript write-up, final approval, agreement to be accountable for all aspects of the work

Syed Muhammad Abdullah: Literature review, Manuscript write-up and critical revision, final approval, agreement to be accountable for all aspects of the work

Hira Imtiaz: Literature review and data collection, final approval, agreement to be accountable for all aspects of the work

Namra Kanwal: Manuscript write-up, literature review, critical revision, final approval, agreement to be accountable for all aspects of the work

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