

Awareness of Antibiotic Prophylaxis Prescription for Patients with Prosthetic Joint Undergoing Dental Implant Placement

Research Article

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Abstract

Purpose: This study aims to assess dentists' awareness and adherence to professional antibiotic prescribing guidelines, including clinical practice guidelines from the American Dental Association (ADA) published in 2015, related to performing dental implant surgeries for patients with prosthetic joints in Saudi Arabia.

Materials and Methods: An observational study utilizing an online validated questionnaire was conducted in Saudi Arabia. The questionnaire was distributed to 156 general dentists and specialists in Saudi Arabia who are placing dental implants, in the public and private sectors.

Results: Thirty out of the 156 participants have placed implants for patients with prosthetic joints. Half of the professional dental personnel (56.40%) reported awareness of the 2015 ADA clinical practice guidelines and (52.60%) applied the guidelines while treating patients with prosthetic joints.

Conclusion: In our study, dentists who place implants have an average awareness of the clinical practice guidelines for prescribing antibiotic prophylaxis for prosthetic joints. However, less than 20% of dentists have experience placing implants for patients with prosthetic joints; most dentists who place implants are aware and apply the updated guidelines.

Introduction

Dental implants are preferable treatment options to replace missing teeth [22]. They are bioinert alloplastic material constituted mainly from pure titanium or titanium alloy that osseointegrate with maxillary or mandibular alveolar bone [22]. Dental implant placement is a surgical procedure requiring soft and hard tissue manipulation [10]. Therefore, patients undergoing this procedure should be assessed medically to rule out any medical conditions that can compromise the patients' health and the desired outcomes [20].

Prescribing prophylactic antibiotics for healthy and medically compromised patients who are undergoing dental implant placement is still controversial [21]. Antibiotics were introduced into modern medicine in 1928 by Alexander Fleming and they have

been prescribed to treat orofacial infections and as a prophylactic against transit bacteremia from the oral microflora to other parts of the body [12, 18]. One of the biggest problems in dental practice is the high incidence of antimicrobial resistance due to the empirical prescription of antibiotics without performing cultures [11]. The development of new strains of bacteria is considered a global health threat and dentists prescribed almost 10% of antibiotics published in NHS general practice in 2016 [11]. In Saudi Arabia, antimicrobial resistance among gram-positive and gram-negative pathogens has increased [3, 23].

Prosthetic joint infection (PJI) is an uncommon dangerous complication of the joint replacement procedure [24]. However, wound contamination at the time of surgery is the most common cause of early PJI, while bacteremia from distant sites of infection or following medical and dental procedures may be re-

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sponsible for late PJI which happens in more than 12 months postoperatively [16, 19].

Both *Staphylococcus aureus* and *Staphylococcus epidermidis* are determined as the organisms most often found infecting late PJI [19]. On the other hand, the oral bacteria released following dental procedures are mostly oral streptococci [16]. These bacteria released in transient oral bacteremia are rarely found in infecting prosthetic joints [16]. Nevertheless, several cases have reported rare late PJI caused by distinct bacterial groups following routine dental care [17]. These include *Streptococcus gordonii* which was seen on the patient's joint aspirate aerobic surgical culture of a case of late PJI of the knee following vigorous dental flossing [15]. Recently, a case of a late PJI of the hip following dental cleaning was caused by the *Streptococcus salivarius* group, a member of the Viridans streptococci family [19]. Yet, it can be concluded that the incidence of PJI caused by oral flora is extremely rare [15].

Over one million total knee and hip joint replacements are performed in the United States yearly [16]. As the years go by, the number of joint replacement surgeries in Saudi Arabia has also increased but remains lower than in western countries [1].

For the sake of life quality improvement for individuals living with prosthetic joints and to restrict the widespread use of antibiotics, the American Dental Association (ADA) and the American Academy of Orthopedic Surgeons (AAOS) in 2012 have developed the guidelines for patients with prosthetic joint replacement and prophylactic antibiotics. In 2015, ADA supported the guidelines and developed the clinical practice guidelines, stating that "In general, for patients with prosthetic joint implants, prophylactic antibiotics are not recommended before dental procedures to prevent prosthetic joint infection" [21]. The clinical reasoning for this recommendation is based on evidence that found no association between dental procedures and PJI or any effectiveness of prophylactic antibiotics [21]. In addition, the potential harm of the antibiotic prescription includes antibiotic resistance, anaphylaxis and opportunistic infection [21]. However, a prophylactic antibiotic is given in certain circumstances after consultation for patients with a history of complications associated with their joint replacement surgery or medically compromised conditions, who are undergoing the dental procedure with gingival manipulation [13, 21]. It is essential to determine an appropriate antibiotic regimen and write the prescription recommended by the orthopedic surgeon [21].

Several studies have assessed the behavior of antibiotic prescription with implant surgery procedures [5]. However, the pattern among specialists is diverse and inconsistent and there is a wide variety of antibiotics prescriptions regarding the time, dose, and duration [5, 8]. The current study aims to assess dentists' awareness and adherence to professional antibiotic prescribing guidelines, including clinical practice guidelines from the ADA when performing dental implant surgeries for patients with prosthetic joints in Saudi Arabia.

Materials and Methods

A cross-sectional descriptive study was conducted using a self-administered questionnaire. The research committee approved this study at the College of Dentistry (Umm Al Qura Univer-

sity, Makkah, Saudi Arabia, IRB # 174-20). A pilot study was carried out to validate the questionnaire and it was revised based on the feedback received from the pilot study. Our sample size was based on a 95% confidence interval and a 5% error margin. Self-administered questionnaires were distributed through social media to 156 general dentists and specialists who performed dental implants surgeries working in governmental and private sectors around Saudi Arabia. The questionnaire consists of 18 questions in two sections, including Yes/No questions, multiple-choice and space for additional comments. The first part included demographic data of the participants, including gender, nationality, specialty, level of experience, sector, degree acquiring location, previous experience of placing implants, and method of communicating with the patient's physician. The second part consisted of 11 questions about if the participants have had placed dental implants for patients with prosthetic joints, knowledge regarding the relation between PJI and dental implant placement, whether an antibiotic is routinely prescribed, the antibiotics prophylaxis protocol according to the clinical practice guidelines of the ADA for patients with prosthetic joints.

The data were processed using SPSS then the results were tabulated as numbers and percentages. Multiple linear regression with backward elimination was used to compare the level of knowledge with demographic variables.

Results

Data from 156 participants were analyzed for this study. Participants' demographic data are shown in Table 1.

Only 30 (19.20%) participants have placed implants for patients with prosthetic joints. Around half of the dental professions communicate with the patient's physician directly via phone or email (57.10%), while the others communicate with the patient's physician indirectly via patients themselves (42.90%). Around half of the dental professions (56.40%) reported awareness of the clinical practice guidelines of the ADA regarding antibiotic prophylaxis to patients with prosthetic joints. Also, 52.60% reported applying them to patients with prosthetic joints, stating that prophylactic antibiotics are not recommended to prevent prosthetic joint infection. Dental professions were asked five questions regarding using dental implants with patients with prosthetic joints. Their answers are shown in Table 2.

The mean of total correct answers is 2.96 with a standard deviation of 1.01 points, out of a maximum score of 5. Multiple linear regression with backward elimination was used to compare the level of knowledge with demographic variables. None of the demographic variables or previous experience were significantly related to the total knowledge score; this includes gender, nationality, specialty, level of experience, sector, degree acquiring location, previous experience of placing implants, method of communicating with patient's physician, reported awareness with updated guidelines or even applying them. This was confirmed again by performing bivariate analysis using T-test and ANOVA, as shown in Table 3.

Discussion

Antibiotic overprescription has led to the emergence of resistant bacteria worldwide (Fluent et al., 2016). The overuse and misuse

Table 1. Participants ' Demographic Data.

Variable		Count	%
Gender	Male	58	37.20%
	Female	98	62.80%
Nationality	Saudi	133	85.30%
	Non-Saudi	23	14.70%
Specialty	General dentist	71	45.50%
	Prosthodontist	27	17.30%
	Pedodontist	22	14.10%
	Intern	10	6.40%
	Oral and maxillofacial surgeon	10	6.40%
	Others	16	10.30%
Where did you get your degree from?	Saudi Arabia	108	69.20%
	Out of Saudi Arabia	48	30.80%
Experience	Less than 5 years	86	55.13
	5-10 years	36	23.08
	More than 10 years	34	21.79
Region	Central region	28	17.90%
	Eastern region	16	10.30%
	Northern region	1	0.60%
	Southern region	6	3.80%
	Western region	105	67.30%
Sector	Governmental sector	104	66.70%
	Privet sector	25	16.00%
	Both	27	17.30%

Table 2. Dental professions knowledge about using dental implants with patients with prosthetic joints.

Do you believe that prosthetic joint infections are related to dental implant placement in patients with prosthetic joint?	Yes	79	50.60%
	No*	77	49.40%
If you would treat such cases, do you routinely prescribe antibiotics prophylaxis for dental implant placement in patients with prosthetic joint?	Yes	97	62.20%
	No*	59	37.80%
Do you refer the patient to his/her physician for consultation before dental implant?	Yes*	132	84.60%
	No	24	15.40%
Do you prescribe the antibiotic for such case by yourself or ask the patient physician to prescribe it?	I prescribe the antibiotic to the patient.	57	36.50%
	The physician should prescribe the antibiotic to the patient. *	99	63.50%
If you prescribe the prophylactic antibiotic, what is your protocol for patient with prosthetic joint?	Loading dose before the treatment only	96	61.50%
	No need. *	30	19.20%
	Single dose after the treatment.	17	10.90%
	Other treatment modalities	13	8.10%

* Represents the correct answer.

of these medications caused a serious issue. In fact, according to the Centers for Disease Control and Prevention each year in the U.S., at least 2.8 million people are infected with antibiotic-resistant bacteria or fungi, and more than 35,000 people die [14]. Also, antibiotic-resistant infections increase poorer health outcomes, the use of more toxic treatment, and higher health care costs [7]. Today, it wildly agrees that following the updated guidelines implanted to improve decision-making and enhance awareness of

the dentists' own prescribing habits regarding antibiotic prophylaxis is a valuable tool to reduce the rising threat [8]. Furthermore, prophylaxis antibiotic was administered as a precautionary measure for dental implant placement for medically compromised patients such as patients with prosthetic joint replacement and the fear of PJI [8].

Although the sample size was small, it was representative of a

Table 3. Dental professions knowledge regarding using implants for patients with prosthetic joints against demographic variables.

Variable		Total knowledge	
		Mean	Standard Deviation
Gender	Male	2.78	1.14
	Female	3.08	0.93
Nationality	Saudi	2.97	1.02
	Non-Saudi	2.96	1.02
Specialty	General dentist/ intern		
	(prosthodontist, pedodontist, oral and maxillofacial surgeon and others)	2.94	0.94
Where did you get your degree from?	Saudi Arabia	2.94	0.96
	Out of Saudi Arabia	3.04	1.15
Experience	Less than 5 years	3.08	0.96
	5-10 years	2.69	1.04
	More than 10 years	2.97	1.11
Sector	Governmental sector	3.05	1
	Privet sector	2.64	0.91
	both	2.96	1.16
Have you ever placed implants for patients with prosthetic joints?	Yes	2.93	1.08
	No	2.98	1.01
How would you communicate with the patient's physician?	Direct by phone or emails	2.93	1
	Indirect through the patient	3.01	1.05
Are you aware of the the clinical practice guidelines of the ADA regarding antibiotic prophylaxis for patients with prosthetic joints?	Yes	3.01	1.04
	No	2.91	0.99
Do you apply the clinical practice guidelines of the ADA guidelines regarding antibiotic prophylaxis to patients with prosthetic joints that state that prophylactic antibiotics are not recommended to prevent prosthetic joint infection?	Yes	3.07	1.11
	No	2.85	0.9

variety of dental professions who placed dental implants and nearly half of them have reported that they are aware of the updated guidelines but only (19.20%) have dealt with patients with prosthetic joints. However, for the surveyed dentists, the demographic variable or previous experience did not translate into better knowledge in either the awareness with the clinical practice guidelines of the ADA or following them.

Along with a survey that conducted in the Western region of Saudi Arabia to assess the awareness of dental practitioners regarding the prescription of antibiotics after routine dental extraction reported that 77% of the dentists would prescribe antibiotics, even though the majority of dentists are aware of the risk of bacterial resistance. However, they still believe that taking antibiotics will prevent odontogenic infections (Al-Sebaei & Jan, 2016). Our study also concluded that 62.20% had said they would routinely prescribe antibiotic prophylaxis before dental implant placement. Another study conducted in Jeddah, Saudi Arabia, shows that 60% of dentists prescribe prophylactic antibiotics routinely before dental implant placement [8].

In the present study, the protocol of antibiotic administration for patients with prosthetic joint, 61.50% agree they would prescribe a loading dose before the treatment. However, 10% suggest that only a single dose after the treatment is sufficient. In addition, another study showed that all dentists had prescribed antibiotics preoperatively of dental implant placement and 41.4% prescribed a postoperative dose [5]. Moreover, some practitioners prescribe antibiotics for healthy patients if they undergo multiple implant surgery with a flap [6]. Because the overprescribing, many authors urged the need to develop strict guidelines to avoid the misuse of antibiotics [13]. The present study shows that the majority of the participants (84.6%) will seek medical consultation with the patients' physician before the implant surgery regarding the need for antibiotic prophylaxis. The most common method of communication was direct via phone or email. This study had some limitations, including that number of participants was small. However, we anticipated that participation might not meet targets because of a coronavirus outbreak during data collection.

Conclusion

The current study found that dentists who place implants are generally aware of the importance of providing antibiotic prophylaxis for patients with prosthetic joints. Although only around 20% of dentists have experienced inserting implants for patients with prosthetic joints, the majority are aware of and follow the updated guidelines. Because the guidelines for using prophylactic antibiotics have changed, different dental professions and patients should be educated that using prophylactic antibiotics prior to dental implant treatments is no longer recommended for dental implants patients with prosthetic joints. This study supports the necessity for dental professionals to be aware of the updated guidelines to avoid antibiotic misuse and life-threatening consequences. Following the updated guidelines will assist in reducing the costs and morbidity that come with improper antibiotic overuse.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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