

Nigerian dentists' knowledge of the current guidelines for preventing infective endocarditis

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Objective: This study assessed Nigerian dentists' knowledge of current guidelines for the prevention of infective endocarditis. **Material and methods:** A self-administered questionnaire surveyed a cross-section of Nigerian dentists gathering information on respondent demographics, awareness of the American Heart Association current guidelines on preventing infective endocarditis and sources of knowledge regarding that guidance. Respondents indicated: a) whether or not they would prescribe antibiotics before dental treatment in 10 cardiac conditions, b) if antibiotic prophylaxis was reasonable before 10 dental procedures in an endocarditis high-risk patient, and c) a prescription for oral antibiotics for an endocarditis high-risk non-allergic adult about to undergo a dental procedure. **Results:** Respondents numbered 173 and 41% were aware of the guidelines. Most commonly the sources of this knowledge were undergraduate/postgraduate education. Overall, the correct responses for the 10 cardiac conditions was very low (33%), ranging from 94% for prosthetic heart valves (94.2%) down to 4% for previous coronary artery bypass (3.5%). For clearly invasive procedures, 80% to 96% of respondents indicated that a prophylactic antibiotic was reasonable. For clearly non-invasive procedures, 89% to 92% indicated that antibiotics were not reasonable. Correct antimicrobial agent, dose and timing of administration were prescribed by 89%, 9%, and 57% respectively. **Conclusions:** A low level of knowledge of the current guidelines was found among Nigerian dentists. Although, most prescribed the correct antimicrobial agent, the numbers prescribing correct dose and time of administration were quite low. Therefore, attempts should be made to teach the current guidelines in Nigerian undergraduate/postgraduate dental education.

Key words: Nigeria, infective endocarditis

Introduction

Infective endocarditis (IE) is an uncommon but life-threatening infection (Wilson *et al.*, 2007). Despite advances in diagnosis, antimicrobial therapy, surgical techniques, and management of complications, patients with IE still have high morbidity and mortality rates related to this condition (Wilson *et al.*, 2007). Since 1955, the American Heart Association (AHA) has recommended peridental operative antibiotic administration to prevent infective endocarditis (IE). The guidelines have been updated many times since then. Since the 1997 AHA guidelines on prevention of IE were published (Dajani *et al.*, 1997) many authorities, societies and conclusions of published studies have questioned the efficacy of antimicrobial prophylaxis to prevent IE in patients who undergo a dental, gastrointestinal (GI), or genitourinary (GU) tract procedure and have suggested that the AHA guidelines be revised (Durack, 1998; Strom *et al.*, 1998). The guidelines were revised in 2007 due to obvious glaring deficiencies of the previous guidelines (Wilson *et al.*, 2007). The revision was based on the fact that the previous recommendations were based on Class IIb recommendations (usefulness/efficacy of the recommendations is less well established by evidence/opinion) and level of evidence C (evidence based only on consensus opinion of experts, case studies, or standard of care) (Wilson *et al.*, 2007).

Knowledge of the recommendation for prevention of infective endocarditis and its compliance is mandatory for clinicians especially when handling patients that undergo a dental, gastrointestinal and genitourinary procedure because of its possible legal implication (Dajani *et al.*, 1990). Inadequate knowledge and poor to fair compliance with the previous versions of the AHA recommendations among patients and health care providers have been reported (Brooks, 1980; Sadowsky and Kunzel, 1988). This has been attributed to the fact that the previous guidelines are cumbersome and confusing (Wilson *et al.*, 2007).

To date, there is no information regarding knowledge of the guidelines for the prevention of infective endocarditis among Nigerian dentists. The aim of the survey was to assess the knowledge and the implementation of a cross section of Nigerian dentists on the current guidelines (American Heart Association, 2007) for the prevention of infective endocarditis.

Material and methods

A self-administered questionnaire (a modification of Zadik *et al.*, 2008) was distributed among a cross-section of Nigerian dentists between March and April 2010. The sample was selected among dentists practicing in private, public and teaching hospitals in the country using convenience sampling method. The information sought

Table 1. Characteristics of the respondents

	Frequency	(%)
<i>Gender</i>		
Male	99	(57)
Female	74	(43)
<i>Year of Graduation</i>		
2007-2009	51	(30)
Before 2007	122	(70)
<i>Current Job description</i>		
House officers	47	(27)
Non-specialist GDP	38	(22)
Resident doctors	78	(45)
Consultants	10	(6)

Table 3. Proportion of correct responses for each item for the question: "Is antibiotic prophylaxis needed before dental treatment in a patient who suffers the following cardiac condition?"

<i>Medical condition</i>	<i>Correct responses</i>		
	<i>Yes/No</i>	<i>Total Number</i>	<i>(%)</i>
Prosthetic cardiac valves	Yes	163	(94)
Patent ductus arterisus	No	32	(19)
Physiologic heart murmurs	No	81	(47)
MVP without valvular regurgitation	No	36	(21)
MVP with valvular regurgitation	No	16	(9)
Myocardial infarct in the last 6 month	No	26	(15)
<i>Previous coronary artery bypass graft</i>			
Surgery	No	6	(4)
Hypertrophic cardiomyopathy	No	67	(39)
Intravascular cardiac pacemakers	No	19	(11)
Previous IE illness	Yes	129	(75)
Average			(33)

MVP=mitral valve prolapsed; IE=infective endocarditis

included demographics of the respondents, awareness of the current AHA guidelines on preventing infective endocarditis and sources of knowledge regarding that guidance. Respondents were also asked to indicate whether or not they would prescribe antibiotics before dental treatment in 10 cardiac conditions. They were also asked if antibiotic prophylaxis was reasonable before 10 dental procedures in an endocarditis high-risk patient. They were further asked to prescribe oral antibiotics (agent, preoperative dosage and timing of administration) for an adult endocarditis high-risk non-allergic patient about to undergo a dental procedure.

Data analysis was done using SPSS for Windows (12.0 version, Chicago IL). Descriptive statistics and tests of significance ($p \leq 0.05$) were used as appropriate.

Results

Out of 200 questionnaires distributed 173 (87%) were returned and analysed. The mean age of respondents was

Table 2. Distribution of source of knowledge of infective endocarditis guidelines

<i>Source of knowledge</i>	<i>Number of respondents</i>	<i>(%)*</i>
Undergraduate education	36	(37)
Postgraduate continuing education	21	(22)
Local literature	10	(10)
International literature	18	(18)
Verbal personal communication	13	(13)
Total	98	(100)

*Some of the 71 respondents indicated more than one response

34.3 years (SD 7.7) and 57% of them were men (Table 1). Time from dental school graduation ranged between 1 and 28 years (mean 6.9, SD 6.3). Most respondents graduated before 2007 and most commonly they were resident doctors in training (Table 1). Only 71 respondents (41%) knew of the current AHA guidelines on the prevention of infective endocarditis and the most common source of this knowledge was their undergraduate education, followed by postgraduate continuing medical education (Table 2). Most respondents indicated more than one source of knowledge; most commonly the above two sources (n=11) followed by undergraduate education and verbal personal communication (n=6). No respondent indicated local literature alone as their source of knowledge. Overall, only 33% of respondents indicated all the correct answers for the cardiac conditions with most correct responses for prosthetic heart valves and previous IE illness but fewest for previous coronary artery bypass and mitral valve prolapsed with valvular regurgitation (Table 3). The correct response rates for pre-and post-2007 graduates were similar ($p=0.17$). Table 4 shows the participants' decisions regarding the need for antibiotic prophylaxis for the 10 dental procedures in a high-risk endocarditis patient. For clearly invasive procedures, endodontics, and clearly non-invasive procedures four-fifths or more responded correctly regarding indications for antibiotic prophylaxis. However, with other procedures listed lower in Table 4 there was greater uncertainty or error.

One hundred and forty-three (83%) prescribed antibiotics for an adult endocarditis high-risk non-allergic patient about to undergo a dental procedure. Thirteen respondents (8%) prescribed correct antibiotics agent, dosage and timing based on the new AHA guidelines. The recommended Amoxicillin was prescribed by 127 (89%), correct dosage (2g) by 9% and timing of administration (30-60 minutes preoperative) were correctly indicated by 57%.

Discussion

Unlike 1997 AHA guidelines which were based on consensus opinion of experts, case studies or standard of care, the 2007 AHA guidelines were based on collected evidence published in numerous studies over the past two decades. The primary reasons for 2007 AHA

recommendations for IE prophylaxis are: (i) IE is much more likely to result from frequent exposure to random bacteremia associated with daily activities than from bacteremia caused by a dental, GI tract, or GU tract procedure; (ii) prophylaxis may prevent an exceedingly small number of cases of IE, if any, in individuals who undergo a dental, GI tract, or GU tract procedure; (iii) The risk of antibiotic-associated adverse events exceeds the benefit, if any, from prophylactic antibiotic therapy and (iv) maintenance of optimal oral health and hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE (Wilson *et al.*, 2007).

Although about 41% of dentists claimed to have knowledge of the current AHA guidelines for the prevention of IE, only a third of the dentists correctly answer correctly for all 10 cardiac conditions. Many Nigerian dentists appear unfamiliar with the details of current guidelines. Zadik *et al.* (2008) reported that all dentists in their study knew of the 2007 guidelines with 81% correctly answering for the ten cardiac conditions.. In the present study, the most prominent inadequate knowledge regarding cardiac conditions was shown in “previous coronary artery bypass graft surgery” (4% correct) and mitral valve prolapsed (MVP) with valvular regurgitation (9%). Zadik *et al.* (2008) however reported a lowest correct response of 58% for MVP with valvular regurgitation.

In the present study, the highest correct responses for which prophylaxis with dental procedures is reasonable were indicated for prosthetic cardiac valves and previous IE illness; and correct response to them was “yes”. This result is similar to the findings of Zadik *et al.* (2008) among practicing Israeli dentists, where 95% and 90% indicated correct response for prosthetic cardiac valves and previous IE illness. Based on the available evidence, the two conditions are reported to be associated with the highest risk of adverse outcome from endocarditis for which prophylaxis with dental procedures is reasonable (Mansur *et al.*, 2001). Few published data quantify the lifetime risk of acquiring IE associated with a specific underlying cardiac condition. Steckelberg and Wilson

(1993) reported the lifetime risk of acquisition of IE, which ranged from 5 per 100,000 patient-years in the general population with no known cardiac conditions to 2160 per 100,000 patient-years in patients who underwent replacement of an infected prosthetic cardiac valve. In that study, the risk of IE per 100,000 patient-years was 4.6 in patients with MVP without an audible cardiac murmur and 52 in patients with MVP with an audible murmur of mitral regurgitation.

Regarding dental procedures and conditions for which antibiotic prophylaxis is reasonable and effective, the 2007 guidelines unlike previous ones recommend prophylaxis for all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa in patients with cardiac conditions associated with the highest risk of adverse outcome from endocarditis (Wilson *et al.*, 2007). This includes procedures such as biopsies, suture removal and placement of orthodontic bands (Wilson *et al.*, 2007). Although IE prophylaxis is reasonable for these patients, its effectiveness, based on the quality of evidence in the literature is unknown (Wilson *et al.*, 2007). The guidelines also stated clearly that the following procedures and events do not need prophylaxis: routine anesthetic injections through non-infected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of deciduous teeth, and bleeding from trauma to the lips or oral mucosa (Wilson *et al.*, 2007).

For high-risk patients and clearly invasive procedures a high percentage of respondents indicated that antibiotic prophylaxis was reasonable. However, between 4% and 21% either indicated that antibiotic prophylaxis was unreasonable or they were unsure. Conversely, about 4-5% of respondents indicated antibiotics prophylaxis for clearly non-invasive procedures such as intra-oral radiography and placement of orthodontic appliance (not bands). The latest AHA guidelines on dental procedures requiring antibiotics prophylaxis in IE high-risk patients were based on the fact that few published studies exist on the magnitude of bacteremia after a dental procedure or

Table 4. Proportion of responses for each item to the question: “Is antibiotic prophylaxis reasonable before the following dental procedures in an endocarditis high-risk patient?”

Dental procedures	Number (%) who responded						Correct response
	Reasonable	Not reasonable	Not sure	Reasonable	Not reasonable	Not sure	
Periodontal surgery	166	(96)	3	(2)	4	(2)	R
Tooth extraction	159	(92)	9	(5)	5	(3)	R
Intraoral radiographs	8	(5)	158	(91)	7	(4)	NR
Placement of orthodontic appliance (not bands)	7	(4)	154	(89)	12	(7)	NR
Endodontic treatment	153	(88)	14	(8)	6	(4)	R
Shedding of a primary tooth	6	(4)	153	(88)	14	(8)	NR
Scaling	138	(80)	31	(18)	4	(2)	R
Tooth preparation with taking of oral impressions	19	(11)	134	(77)	20	(12)	R
Local anesthetic infiltration	44	(25)	108	(63)	21	(12)	NR
Restoration of gingival (class II) caries lesion	88	(51)	72	(42)	13	(7)	NR

Note: R=Reasonable; NR=Not reasonable

from routine daily activities, and most of the published data used older, often unreliable microbiological methodology (Wilson *et al.*, 2007). There are no published data demonstrating that a greater magnitude of bacteremia, compared with a lower magnitude, is more likely to cause IE in humans. The magnitude of bacteremia resulting from a dental procedure is relatively low (104 colony-forming units of bacteria per ml), similar to that resulting from routine daily activities, and is less than that used to cause experimental IE in animals (106 to 108 colony-forming units of bacteria per ml) (Durack and Beeson, 1972, Roberts *et al.*, 2006). It is also believed that the frequency, nature and duration of bacteremia associated with routine daily activities unrelated to dental procedures (brushing, flossing, chewing food) are far greater than during a few minutes/hours of dental procedures (Wilson *et al.*, 2007).

Although about 90% of respondents prescribed the recommended antibiotic agent, only 9% indicated the correct dosage and 57% the correct timing of administration. The high number of those who prescribed correct antibiotic agent may be due to the fact that Amoxicillin has been the preferred antibiotic for antibiotic prophylaxis in IE prone patients since 1990 (Dajani *et al.*, 1990; 1997). The current AHA guidelines (2007) recommend that antibiotics for prophylaxis should be administered in a single dose before the procedure. If the dosage of antibiotic is inadvertently not administered before the procedure, the dosage may be administered up to 2 hours after the procedure (Wilson *et al.*, 2007). However; administration of the dosage after the procedure should be considered only when the patient did not receive the pre-procedure dose.

Some patients scheduled for an invasive procedure may have a coincidental endocarditis. The presence of fever or other manifestations of systemic infection should alert the provider to the possibility of IE. In these circumstances, it is important to obtain blood cultures and other relevant tests before administering antibiotics intended to prevent IE and failure to do so may result in delay in diagnosis or treatment of a concomitant case of IE (Wilson *et al.*, 2007).

Conclusions

A low level of knowledge of the current AHA guidelines on antibiotics prophylaxis in IE high risk patients undergoing dental procedures was found among Nigerian dentists. The lack of awareness and familiarity with the latest guidelines' detail may reflect the fact that most respondents graduated before their release; and many have not acquainted themselves with the current version. Therefore, attempts should be made to teach the current guidelines in both the undergraduate curriculum and in continuing postgraduate dental education.

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