

# Current Knowledge and Awareness among Paedodontists of Maharashtra Regarding Prevention of Infective Endocarditis

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## ABSTRACT

### BACKGROUND

Infective endocarditis is an infection of the endothelium of heart and heart valves with serious and fatal complications that often requires long-term treatment. Bacteraemia is considered to be an important step for the onset of infective endocarditis (IE) and mainly induced by invasive dental treatments, including tooth extraction, periodontal surgery, scaling and root planing. The purpose of this study was to evaluate the knowledge among the paedodontists concerning the preventive measures for infective endocarditis and to spread the awareness about the same, thus filling the clinical practice gap between dentists and cardiologists by helping in making collaborative decisions.

### METHODS

A questionnaire survey was given to the paedodontists in India in order to collect information regarding their current common knowledge about infective endocarditis and for the future construction of an approach to improve this situation.

### RESULTS

68.4 % of the paedodontists taking the survey preferred giving antibiotic prophylaxis mainly orally whereas 21.1 % preferred to give it orally rather than IV and 10.5 % of them preferred IV rather than oral. None of them preferred giving antibiotics intravenously. With regard to the type of antibiotics preferred, most preferred was oral amoxicillin (89.5 %) and other antibiotics were (10.5 %); whereas, no one preferred IV ampicillin. 89.5 % of our respondents felt that antibiotic prophylaxis was definitely needed whereas 10.5 % of them felt that it was partially needed.

### CONCLUSIONS

Practitioners, cardiologists and the dentists need to discuss the potential benefits and also the harm of antibiotic prophylaxis with their patients before a decision is made about antibiotic administration.

### KEY WORDS

Infective Endocarditis, Paedodontists, Cardiologists

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**BACKGROUND**

Infective endocarditis a life-threatening condition that occurs in patients with underlying heart disease and is mainly caused by bacteraemia which is induced by invasive dental treatment.<sup>1</sup> Due to this, there forms a bacterial mass termed vegetation on damaged heart valves, leading to severe valvular dysfunction.<sup>2</sup> The aortic valve is more frequently affected, followed by mitral valve, whereas tricuspid valve involvement is considered to be rare.<sup>3</sup> Repeated attacks of endocarditis reduce the 5-year survival of patients to 60 %.<sup>4</sup> The most common causative organisms of IE reported in Japan were oral streptococci, followed by staphylococci indicating that prevention of IE should be considered by collaborative discussions between dentists and cardiologists.<sup>5-7</sup>

Bacteraemia is induced by invasive dental procedures, such as tooth extraction and periodontal surgery, and antibiotic prophylaxis is given prior to performing dental procedures to the patients at risk of IE.<sup>8-10</sup> The initial guidelines for prevention of IE were proposed in 1955 by the American Heart Association (AHA), then modified based on clinical and scientific evidence, with the most recent published in 2007 (AHA 2007).<sup>11</sup> Lauber showed clinicians are not always aware of current clinical guidelines, whereas dentists and physicians exhibit different patterns regarding antibiotic prescription. Dentists were more familiar than physicians with current American Heart Association (AHA) protocols.<sup>12</sup> The changes that were elaborated in AHA 2007 were that prior to dental procedures, prophylaxis is considered reasonable only for those patients with underlying cardiac conditions associated with the highest risk of an adverse outcome, as well as for procedures involving manipulation of gingival tissue or the periapical region of the teeth in such patients.<sup>11</sup>

In the present study, we performed a survey to evaluate the knowledge of paedodontists with regards to association between dental procedures and the acquisition of infective endocarditis. Also, to focus on antibiotic prophylaxis for prevention of infective endocarditis.

**METHODS**

A questionnaire survey was given to the paedodontists in India in order to collect information regarding their current common knowledge about infective endocarditis and for the future construction of an approach to improve this situation.

This study was carried out electronically due to Covid constraints. A preformed structured questionnaire was distributed to paedodontists across the country from January 2020 to August 2020. Amongst the questionnaires distributed, 200 participants responded, and thus 200 completed questionnaires were considered for the study, which were then analysed. A preformed structured questionnaire was prepared which consisted the data such as the high-risk factors, the timing, the mode and the type of antibiotics etc. The subjects were informed about the purpose of the study and that their information was kept confidential.

**Statistical Analysis**

Data was entered in Microsoft Excel sheet and then transferred to Epi Info Software (7.1) and analysed.

**RESULTS**

47.4 % of our respondents have been practicing for less than 2 years, 21.1 % for 2 - 5 years, 15.8 % for 5 - 10 years and 15.8 % for more than 10 years. 42.1 % of the paedodontists selected rheumatic heart disease (RHD) as the high-risk factor for infective endocarditis, whereas 26.32 % have chosen congenital heart disease (CHD), 21.05 % have chosen pacemaker as a risk and 10.53 % have chosen mitral valve prolapse with regurgitation. There are none who felt that atrial and mitral septal defect can be a risk factor.

Questions	Response	Percentage %
Since how many years have you been practicing?	Less than 2 years	47.37
	2 - 5 years	21.05
	5 - 10 years	15.79
	10 years or more	15.79
What risk factors do you consider to be high risks for infective endocarditis?	Congenital heart disease	26.32
	Rheumatic heart disease	42.11
	Mitral value prolapses with regurgitation	10.53
	Pacemaker	21.05
What kind of dental treatment requires prophylactic antibiotics?	Atrial septal defect	0.00
	Mitral septal defect	0.00
	Filling	0.00
What is the timing for antibiotics prescription?	Tooth extraction	89.47
	Pulpotomy	5.26
	Scaling	5.26
How do you perform antibiotic prophylaxis?	Before treatment in days	26.32
	Immediately	73.68
	After treatment in days	0.00
What type of antibiotics do u use for antibiotics prophylaxis?	Mainly IV	0.00
	IV rather than oral	10.53
	Oral rather than IV	21.05
	Mainly oral	68.42
Do you think antibiotics prescription is necessary for prevention of infective endocarditis?	Oral amoxicillin	89.47
	IV ampicillin	0.00
	Others (macrolides, azithromycin, tetracycline)	10.53
How many cases of infective endocarditis have you encountered during your practice?	Definitely needed	89.47
	Partially needed	10.53
	Not needed at all	0.00
Are you or your clinic equipped to manage an emergency case of infective endocarditis?	0 - 10	89.47
	10 - 20	10.53
	20 or more	0.00
What training is required to manage cardiac patients?	Yes	57.89
	No	42.11
	BLS, no ACLS	5.26
	BLS and ACLS	89.47
	ICU	5.26
	None of the above	0.00

*Table 1. Results of Our Study*

With regards to the dental treatment that requires prophylactic antibiotics, tooth extraction was the most preferred answer (89.5 %) followed by pulpotomy and scaling both being 5.26 %. Tooth filling wasn't chosen by any of our respondents. Regarding the timing of antibiotics prescription, majority of paedodontists (73.7 %) preferred giving antibiotics immediately before the treatment and 26.3 % preferred giving antibiotics few days before treatment,

whereas there was no response for giving it after treatment. 68.4 % of paedodontists taking the survey preferred giving antibiotic prophylaxis mainly orally whereas 21.1 % preferred to give it oral rather than IV and 10.5 % of them preferred IV rather than oral. None of them preferred giving antibiotics mainly IV. With regards to the type of antibiotics preferred, the most preferred was oral amoxicillin (89.5 %) and others were (10.5 %) whereas no one preferred IV ampicillin. 89.5 % of our respondents feel that antibiotic prophylaxis is definitely needed whereas 10.5 % of them felt that it is partially needed. None of them were in support of not needing the antibiotics at all. 89.5 % of our paedodontists have encountered 0 - 10 cases and the rest have encountered between 10 - 20 cases in their practice. 89.5 % of our respondents have chosen both basic life support (BLS) and advanced cardiovascular life support (ACLS) while 5.26 % each have chosen BLS, no ACLS and intensive care unit (ICU) respectively. 57.9 % of our paedodontists said that / their clinics were equipped to manage any emergency cases of infective endocarditis while the rest (42.1 %) weren't.

**DISCUSSION**

It is imperative to be aware of the presence of heart disease in patients prior to dental treatment. When a cardiologist refers the patient then the condition is generally known. However, such cases are speculated to be less, as patients often visit dentists directly without any referral. Therefore, education regarding the risk for infective endocarditis (IE) caused by dental treatments is important for at-risk patients.<sup>1</sup> While some dental procedures and some specific cardiac problems are well recognised to be a clear indication for antibiotic prophylaxis in prevention of IE; there is still some controversy over other dental treatments as to prophylaxis has to be taken or not.<sup>13</sup>

In our study, the major risk factor considered by our respondents was rheumatic heart disease whereas none of them considered atrial and mitral septal defects to be a risk factor. The results of a study by Hashemipour et al. showed that previous bacterial endocarditis, rheumatic heart disease, and mitral valve prolapse with valvular regurgitation were diagnosed by dentists to be the most common conditions that needed antibiotic prophylaxis.<sup>14</sup> Ventricular septal defects (VSD) accounts for 28.3 %, whereas atrial septal defect (ASD) (6.7 %).<sup>15</sup> With regards to antibiotic prophylaxis for dental treatment, tooth extraction, pulpotomy and scaling were considered as risk in that particular order whereas tooth filling wasn't considered as risky in our study. In a study between one-step formocresol pulpotomy and bacteraemia, a 4 % incidence of bacteraemia was found, although the authors pointed out that this is lesser than most other dental procedures and roughly equivalent to the reported frequency of spontaneous bacteraemia.<sup>16</sup> Baumgartner et al. (1977) found a detectable bacteraemia in only one of the 30 patients undergoing nonsurgical root canal treatment, with an incidence of 3.3 % as opposed to 83.3 % following flap retraction, 33.3 % following periapical curettage and 100 % following dental extraction.<sup>17</sup> It appears that the majority of dentists would not use ultrasonic scalers in the management of periodontal disease in patients fitted with a pacemaker or an implantable cardiac defibrillator (ICD).<sup>18</sup>

Procedure	Percentage %
Baseline rate	9
Intraligamentary injection	96.6
Multiple extractions (4)	51
Single extraction	39
Mucoperiosteal flap	39
Tooth brushing	38.5
Matrix band placement with wedge	32
Rubber dam placement	29.4
Ultrasonic scaling of teeth	25.2
Polishing teeth	24.5
Slow-speed drill	13
High speed drill	4

**Table 2. Incidence of Bacteraemia Noticed Following Various Dental Procedure<sup>19</sup>**

American Heart Association	British Society for Antimicrobial Chemotherapy	British Cardiac Society
Manipulation of gingival, periodontal and periapical tissues; incision of mucosa including: Surgery, periodontal procedures, endodontic instrumentation beyond the apex or apical surgery Subgingival placement of antibiotic fibre or strip, initial placement of orthodontic bands but not brackets, intraligamentary local anaesthetic -prophylactic cleaning of teeth or implants where bleeding is anticipated Excluding: local anaesthetic placement (unless through site of infection)	Dental procedures involving dentogingival manipulation and endodontics. A risk assessment, which involves the patient, is important and factors like the oral hygiene status of the patient are important considerations for deciding On prophylaxis.	Examination procedures, periodontal probing Investigation procedures, sialography Anaesthetic procedures- intra-ligamental local anaesthesia All surgical procedures Restorative procedures -rubber dam placement- matrix band and wedge placement-gingival retraction cord placement Periodontal procedures- Professional cleaning procedures-polishing teeth with a rubber cup -oral irrigation with water jet-scaling, root planning -antibiotic fibres or strips placed sub gingivally Endodontic procedures- root canal instrumentation beyond the root apex- Avulsed tooth reimplantation Orthodontic procedures- tooth separation -exposure or exposure and bonding of tooth or teeth

**Table 3. Dental Procedures for Which Antibiotic Prophylaxis is Recommended.<sup>20</sup>**

			Regimen: Single Dose 30 - 60 min before the Procedure
Situation	Agent	Adults	Children
Oral	Amoxicillin	2 g	50 mg / kg
Unable to take oral medication	Ampicillin or Cefazolin or Ceftriaxone	2 g IM	50 mg / kg IM or IV
		or IV 1g IM or IV	50 mg / kg IM or IV
Allergic to penicillin or ampicillin-oral	Cephalexin or Clindamycin or	2 g	50 mg / kg
	Azithromycin or Clarithromycin	600 mg	20 mg / kg
		500 mg	25 mg / kg
Allergic to penicillin or ampicillin oral and unable to take oral medication	Cefazolin or Ceftriaxone or Clindamycin	1 g IM	50 mg / kg IM or IV
		or IV	
		600 mg IM or IV	20 mg / kg IM or IV
			Cephalosporins should not be used in pts with history of anaphylaxis, angioedema, urticaria with penicillin or ampicillin

**Table 4. Reaffirmed Recommended Regimen, 2017<sup>23,24</sup>**

In a study conducted by Roberts et al. in children in 1997 the following incidences of bacteraemia was noticed following various dental procedure.<sup>19</sup>

In our study, with regards to the type of antibiotics, the most preferred was oral amoxicillin, while the most preferred route was oral. There seems to be a major confusion, regarding the type and the antibiotics preferred among the dentists. In a study conducted by Dajani et al. in 1997, it was reported that standard prophylactic regimen for certain dental procedures was 2.0 grams amoxicillin orally 30 - 60 minutes before procedure.<sup>9,20</sup> Dajani and colleagues have also reported that 2 grams of amoxicillin provides several hours of antibiotic coverage.<sup>21</sup>

In 2017, The ADA has reaffirmed the recommended regimen as follows.<sup>23, 24</sup> Regarding being equipped with the cardiac care in the dental clinic, and the importance of basic life support and advanced life support, there is not much awareness spread among dentists. Emergency cardiac care includes all responses that are required to deal with sudden and life-threatening events affecting the cardiovascular, cerebrovascular and pulmonary systems. It specifically includes.<sup>25</sup>

- Recognition of any early warning signs of heart attack and efforts to prevent complications, reassurance of the victim and prompt availability of monitoring equipment.
- Provision of immediate basic life support at scene when required.
- Provision of advanced cardiac life support at the scene as quickly as possible to defibrillate and if necessary, to stabilize the victim before transportation.
- Transfer of stabilized victim to a hospital so as to provide a definitive cardiac care.

## CONCLUSIONS

Certain type of dental procedures and also some of the specific cardiac lesions are well recognised as requiring provision of antibiotic prophylaxis for the prevention of infective endocarditis. Unfortunately, in some dental management situations there is controversy as to whether or not this should be provided.<sup>26</sup> Ethically, practitioners, cardiologists and dentists need to discuss the potential benefits and also the harm of antibiotic prophylaxis with their patients before a decision is made about antibiotic administration.<sup>27</sup> Thus, a further need for extensive awareness amongst the dentists is required, so as to prevent the occurrence of infective endocarditis during dental procedures.

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

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