

Full Length Research Paper

Frequency and Types of Bacteremia Post-Dental Extraction at UBTH, Benin City

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170 patients attending the Oral and Maxillofacial Surgery Clinic of the University of Benin Teaching Hospital, Benin City, Nigeria, were screened bacteriologically, to determine the prevalence of bacteraemia following dental extraction procedures. 5 ml of blood was collected from each patient before and after the extraction. Post-operative bacteraemia occurred in 55 (32.4%) of the 170 patients screened. 61 (78.2%) of the 78 isolates obtained in the survey were facultative anaerobes while 17 (21.8%) were obligate anaerobes. Amongst the facultative anaerobes, the most frequently isolated bacterial genus was *Staphylococcus* (19, 24.4%) followed by *Streptococcus* spp. (16, 20.5%) and α -haemolytic *Streptococcus* spp. (10, 12.8%). *Bacteriodes* spp. (8, 10.3%) was the most frequently isolated anaerobe followed by *Peptostreptococcus* spp. (5, 6.4%) and *clostridium* spp. (4, 5.16%). The occurrence of bacteraemia increased with duration of extraction and number of teeth extracted. It also occurred more frequently when teeth were extracted because of inflammatory dental disease.

Key words: Bacteraemia following dental extraction.

INTRODUCTION

The occurrence of bacteraemia following dental procedures is well documented in literature (Cawson, 1991; Rhan et al., 1995; Rajasuo et al., 2004). Bacteria obtained in the blood cultures are similar to bacteria of the normal oral flora (Pedersen et al., 1993). They include anaerobes such as *Peptostreptococcus*, *Propionibacterium*, *Bacteroides*, *Prevotella* and *Fusobacterium* spp., as well as facultative anaerobes such as *Streptococcus*, *Actinomyces* and *Staphylococcus* spp. (Otten et al., 1987; Okabe et al., 1995; Rajasuo et al., 2004). While the occurrence of transient bacteraemia after a dental procedure does not lead to any complication, in healthy individuals, it can create serious problems in certain individuals (Rhan et al., 1995). In individuals with congenital or acquired heart disease, or those fitted with a valvular prosthesis, circulating bacteria may reach the defective endocardium and cause bacterial endocarditis (Bender and Barkan, 1989). Bacteraemia could also be

fatal in the elderly and children (Roberts et al., 1998), patients with uncontrolled diabetes (Li et al., 2000), and other body prostheses such as prosthetic joint replacements (Waldman et al., 1997).

The possibility of oral organisms from bacteraemia causing serious complications has encouraged some dentists to recommend antibiotic prophylaxis for patients undergoing dental procedures as well as conduct research into possible risk factors. This is particularly so in localities where patients occasionally present with underlying and sometimes undiagnosed medical problems, which make them high-risk patients. This report augments published reports on the prevalence, aetiological agents and risk factors of bacteraemia in patients undergoing dental extractions in parts of Benin City, Nigeria.

MATERIALS AND METHODS

Study population

170 normal, healthy, medically fit adults aged 18 – 67 years visiting

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Table 1. Prevalence of bacteraemia in patients undergoing teeth extractions.

Sex	No. of patients	Age (Mean ± SD years)	Positive bacteraemia (%)
Male	62	30.9 ± 13.3	15 (24.2)
Female	108	29.2 ± 12.3	40 (37.0)
Total	170	31.2 ± 13.8	55 (32.4)

Table 2. Prevalence of bacteria in bacteraemic patients.

Bacterial isolates	Females (%) (n = 108)	Males (%) (n = 62)	Total (%) (n = 170)
Anaerobic <i>Streptococcus</i>	3 (2.30)	2 (3.23)	5 (2.94)
<i>Bacteroides</i> spp.	5 (4.63)	5 (8.06)	8 (4.71)
<i>Clostridium</i> spp.	3 (2.30)	1 (1.61)	4 (2.35)
Coliform organisms	3 (2.30)	5 (8.06)	8 (4.71)
Diphtheroids	0 (0.00)	4 (6.45)	4 (2.35)
<i>Providencia</i> spp.	1 (0.09)	3 (4.84)	4 (2.35)
<i>Staphylococcus aureus</i>	10 (9.30)	9 (14.52)	19 (11.18)
α-Haemolytic <i>Streptococcus</i>	7 (6.50)	3 (4.84)	10 (5.88)
<i>Streptococcus</i> spp.	8 (7.41)	8 (12.90)	16 (9.41)
Total	40 (37.04)	38 (61.29)	78 (45.88)

the Oral and Maxillofacial Surgical Clinic of the University of Benin Teaching Hospital (UBTH) Benin City, for dental extractions were sampled. Permission for study was obtained from the Ethics Committee in UBTH, and informed consent was also obtained from each patient.

Sample collected

Paired peripheral blood samples were collected from each patient by venipuncture. 10 ml of blood was obtained pre-operation and another 10 ml within 3 min of completion of the procedures. 5 ml of each sample was inoculated into separate blood culture bottles containing nutrient broth and thioglycollate broth. Nutrient broth cultures were incubated aerobically while the thioglycollate broth cultures were incubated anaerobically in Gas pak jars at 37°C for 10 days. Cultures with evidence of growth such as turbidity and/or hemolysis were subcultured. The nutrient broth cultures were sub cultured onto plates of blood agar, chocolate agar and MacConkey agar. The blood and MacConkey agar plate were incubated aerobically while the chocolate agar plates were incubated under increased carbon dioxide tension in candle jars at 37°C for 48h. The thioglycollate blood culture were subcultured onto plates of blood agar and incubated anaerobically as above for 48 h also. Colonies on these plates were identified by standard bacteriological methods (Cowan and Steel, 1974).

Antibiotic sensitivity testing

The Kirby-Bauer disk-diffusion method was used to test bacterial susceptibility to antibiotics. Commercially available multidisks (sigma chemicals) containing the following antibiotics ciprofloxacin (5 µg), perfloxacin (10 µg), ofloxacin (10 µg), erythromycin (15 µg), gentamicin (10 µg), amoxicillin (20 µg), chloramphenicol (30 µg), amoxicillin-clavulanate (30 µg), streptomycin (10 µg) clindamycin (2 µg), tetracycline (30 µg), cloxacillin (5 µg) and co-trimoxazole (25 µg) were used on Diagnostic sensitivity agar plate cultures of each isolate. Cultures were incubated as above, and zones of inhibition

after incubation were interpreted as outlined in the methodology (Bauer et al., 1966).

RESULTS

Bacteraemia, following dental extraction occurred in 55 (22.4%) of the 170 patients screened. 15 (24.2%) males and 40 (37.0%) females were affected (Table 1). The difference in frequency of occurrence between males and females was however, statistically insignificant.

A total of 78 isolates was obtained from the survey. 17 of the isolates were anaerobes and 61, facultative anaerobes. The most frequently isolated anaerobes were *Bacteroides* (8), following by anaerobic *Streptococcus* spp. (5) and *Clostridium* spp. (4). *Staphylococcus aureus* isolates (19) were the most frequently isolated, followed by non-haemolytic *Streptococcus* spp. (16) and α-haemolytic *Streptococcus* spp. (10) amongst the facultative anaerobes (Table 2). There was no significant difference ($P > 0.05$) in the distribution of genera between males and females. Rate of occurrence of bacteraemia was about the same in patients who had simple extraction (31.5%) and those who had surgical teeth extraction (32.0%) as shown in Table 3. Rate of occurrence of bacteraemia was more frequent in patients who presented with inflammatory diseases (39.8%) then in those with non-inflammatory diseases (20.9) as shown in Table 4. The difference was statistically significant ($\chi^2 = 0.004$; $p = 0.05$).

Rates of bacteraemia increased with the number of teeth extracted (Table 5), as occurrence was 27.5% in patients who extracted a tooth and 100% in those who had 6 teeth extracted. It also increased with duration of

Table 3. Effect of type of extraction on bacteraemia occurrence.

Procedure	No. of patients	Bacteraemia positive cases (%)
Simple extraction	120	39 (32.5)
Surgical extraction	50	16 (32.0)
Total	170	55 (100.0)

Table 4. Indicators for tooth/teeth extraction and the occurrence of bacteraemia.

Indicators (diseases)	No of patients	Positive bacteraemia cases (%)
Inflammatory diseases	103	41 (39.8)
Pericoronitis	8	5 (62.5)
Apical periodontitis	70	22 (31.4)
Chronic periodontitis	10	3 (30.0)
Dento-alveolar abscess	15	11 (73.3)
Non-inflammatory diseases	67	14 (20.9)
Impacted teeth	50	11 (20.0)
Supernumeraries	7	1 (14.3)
Preparation for prosthetic txt	5	2 (40.0)
Orthodontic reasons	5	0 (0.0)

Table 5. Effect of number of teeth extracted and the occurrence of bacteraemia.

No. of teeth extracted	No. of patients	Positive bacteramia cases (%)
1	91	25 (27.5)
2	45	10 (22.2)
3	17	9 (52.9)
4	12	7 (58.3)
5	3	29 (66.7)
6	2	2 (100.0)

the operation (Table 6). Prevalence increased from 18.8% in those whose operations lasted less than 10 min to 84.2% in those lasting over 100 min.

DISCUSSION

Incidence of bacteraemia following dental extractions is well documented in literature. The frequency of occurrence varies in different reports. The 32% observed in this report is similar to the 38% reported in some earlier reports (Roberts et al., 1997) but different from the 80% and 88% prevalence rates in some others (Bhatawasekar and Bhardwaj, 2002; Rajasuo et al., 2004).

A total of 78 species were isolated from the 55 positive cases. Bacteraemia of polymicrobial aetiology following dental procedures have been reported by several workers (Otten et al., 1987; Li et al., 2000). The oral cavity has a polymicrobial flora, which can gain access into the blood stream during dental extractions.

Bacteria isolated in this survey are similar to those in previous reports (Li et al., 2000; Bhatawasekar and

Bhardwaj, 2002; Rajasuo et al., 2004). Facultative anaerobes were the predominant isolates (Table 2) as shown in some earlier reports (Anuradha et al., 1998). Strict anaerobes were, however, the predominant isolates in some earlier surveys (Li et al., 2000; Rajasuo et al., 2004). These variations result probably from factors such as media and methods used for anaerobic culture, types of dental procedures and exact time of sampling, which varied in different reports. *Staphylococcus aureus*, *Streptococcus* spp. and α -haemolytic *Streptococcus* spp. were the most frequently isolated facultative anaerobes while *Bacteroides* and anaerobic streptococci were the predominant anaerobes. These isolates are similar to those in earlier reports (Anuradha et al., 1998; Li et al., 2000). They are all characteristic autogenic bacteria.

Type of extraction had no effect on occurrence of bacteraemia, which was also higher in patients with inflammatory disease. Occurrence of bacteraemia increased with the number of teeth extracted and duration (Tables 4 - 6). The nature of dental pathology prior to tooth extraction such as bacteria from an already infected

Table 6. Effect of duration of extraction on the occurrence of bacteraemia.

Duration of procedure (min)	No. of patients	Positive bacteraemia cases (%)
0-9	16	3 (18.8)
10 -29	68	8 (11.8)
30 – 49	38	10 (26.3)
50 – 69	16	8 (50.0)
70 – 99	13	10 (76.9)
> 100	19	16 (76.9)

focus can result in increase patients with inflammatory disease. Increase in number of teeth extracted and increase duration of procedures will increase the chances of seeding the bloodstream with other organisms. This is so because the number and time of exposure of blood vessels opened to oral bacteria are increased in these instances.

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