

## Occupational Hazards Among Clinical Dental Staff

Adebola Fasunloro, BChD; Foluso John Owotade, BChD, FWACS



### Abstract

Although identification of risks to dental healthcare workers has been explored in several industrialized nations, very little data is available from developing countries. This paper examines the occupational hazards present in the dental environment and reports survey results concerning attitudes and activities of a group of Nigerian dental care providers.

A survey on occupational hazards was conducted among the clinical dental staff at the Dental Hospital of the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife in Osun State, Nigeria. Thirty eight of the forty staff responded, yielding a response rate of 95%. Subject ages ranged from 26 to 56 years with approximately 25% in the 31-46 year old bracket. All of the staff were aware of the occupational exposure to hazards, and the majority had attended seminars/workshops on the subject. Only five staff members (13.2%) owned a health insurance policy and 26 (68.4%) had been vaccinated against Hepatitis B infection. All dentists (24) had been vaccinated compared with only two non-dentists; this relationship was significant ( $p= 30.07$ ,  $\chi^2=0.000$ ). Fourteen members of the clinical staff (36.8%) could recall a sharp injury in the past six months, and the majority (71.1%) had regular contact with dental amalgam. Wearing protective eye goggles was the least employed cross infection control measure, while backache was the most frequently experienced hazard in 47% of the subjects. The need for Hepatitis B vaccinations for all members of the staff was emphasized, and the enforcement of strict cross infection control measures was recommended. The physical activities and body positions that predispose workers to backaches were identified and staff education on the prevention of backaches was provided.

**Keywords:** Occupational hazards, dental staff, cross infection control

**Citation:** Fasunloro A, Owotade FJ. Occupational Hazards Among Clinical Dental Staff. J Contemp Dent Pract 2004 May;(5)2:134-152.

## Introduction

Although identification of risks to dental health-care workers has been explored in several industrialized nations, very little data is available from developing countries. This paper examines the occupational hazards present in the dental environment and reports survey results concerning attitudes and activities of a group of Nigerian dental care providers.



Occupational hazard can be defined as a risk to a person usually arising out of employment.<sup>1</sup> It can also refer to a work, material, substance, process, or situation that predisposes, or itself causes accidents or disease, at a work place.<sup>2</sup> The history of occupational hazard awareness can be traced back to the 18<sup>th</sup> century when Bernadino Ramazzini, who is referred to as the father of occupational medicine, recognized the role of occupation in the dynamics of health and diseases.<sup>2</sup>

The practice of dentistry exposes dental professionals to a variety of work-related hazards. These include:

- Working long hours at a high level of concentration
- Working in a sedentary state
- Working with anxious patients
- Exposure to microbial aerosols generated by high-speed rotary hand pieces
- Exposure to various chemicals used in clinical dental practice
- Other hazards

These hazards can pose significant risks to dental practitioners.<sup>3</sup>

The occupational hazards found among dentists and other clinical dental workers are similar worldwide and include a wide range of risks and sometimes even legal hazards. The source of these hazards is the work environment which can include physical, chemical, biological, mechanical, and social aspects.<sup>2</sup>

**Physical Hazards:** The dentist and the clinical staff are at risk of physical injuries during many dental procedures.<sup>4</sup> Sources of physical injury

can include debris from the oral cavity striking the eyes, cuts from sharp instruments, or puncture wounds from needles or other sharp instruments. Such injuries can result in the transmission of serious infectious disease to the dental worker. Needlestick injuries and cuts from sharp objects and instruments (percutaneous injuries) have been reported in 1-15% of surgical procedures mostly associated with suturing. In the United States more than 800,000 needle stick injuries occur each year despite continuing education and efforts to prevent them.<sup>4</sup>

Eye injuries may occur from projectiles such as bits of calculus during scaling procedures and splatters from body fluids (bacterial and viral aerosols) while using high-speed hand pieces. Another potential source of eye injury is the intense dental curing light. Users of dental curing lights should be advised to employ protective eye-wear during use.<sup>5,6</sup>

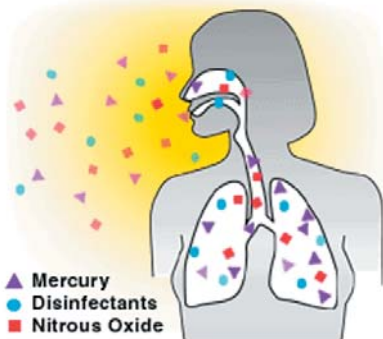


The most common injuries reportedly experienced by the dental hygienist are musculoskeletal in nature.<sup>7</sup> The need to work in a fixed working position using a continuous repetitive motion can predispose the clinical dental worker to wrist ache, lower backache, and neckache.<sup>3</sup>

**Chemical Hazards:** The chemical environment is one of the most rapidly expanding components of the work environment because new chemicals and solutions are being introduced regularly.<sup>2</sup> Many of these chemicals are among those whose health effects may not be known and may pose health problems taking years to manifest.<sup>2</sup>

Many biomaterials and auxiliary products used in dentistry are chemically reactive.<sup>8</sup> Hazardous

chemical agents used in clinical dentistry include mercury, powdered natural rubber latex (NRL), disinfectants, and nitrous oxide (N<sub>2</sub>O). By far the most important and most dangerous of these agents is mercury.<sup>9</sup> Its use in dental amalgam has the potential for continuous occupational exposure of a dental practitioner to mercurial vapor which can be absorbed via the skin and the lungs.<sup>9,10</sup> The active component in the mercurial vapor has a particular affinity for brain tissue. Mercury poisoning can be characterized by tumors of the face, arms, or legs and can also be associated with progressive, tremulous illegible handwriting and slurred speech. The exposure risks for mercury can be minimized by careful handling procedures.



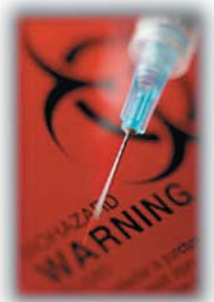
The continued use of powdered NRL gloves and disinfectants has predisposed clinical dental workers to hand dermatitis, contact dermatitis, contact urticaria, and allergic dermatitis.<sup>11</sup> The most serious potential hazard associated with the continued use of powdered NRL gloves in dental practice is latex sensitization caused by exposure to aerosolized NRL protein. This can result in dermatitis on the hands. This occurs with such frequency that it is now recognized as an occupational hazard in dentistry, and many dental offices have had to stop using latex materials such as gloves and rubber dams.<sup>11,12</sup> In recent studies, the frequency of occupational related dermatosis varied from 21% to 43% depending on the prevailing material used in the various specialties.<sup>13</sup>

Transient irritative reactions of the eyes and airways have been observed mostly associated with exposure to volatiles from resin based materials, x-ray chemicals, and cleansers. These include procaine, soaps, eugenol, iodine, formalin, phenol, and other disinfectants. More recently, reactions to methyl metacrylate monomer

and elastomeric impression materials have been described and are the focus of intensive research.<sup>8</sup>

Although N<sub>2</sub>O was for many years believed to have no toxicity other than that associated with its anaesthetic actions, the neurological abnormalities in healthcare workers chronically exposed to N<sub>2</sub>O have disproved this notion. Retrospective surveys of dental and medical personnel have linked occupational exposure to N<sub>2</sub>O with a number of health problems and reproductive derangements.<sup>14</sup> Thus, adequate pollution control mechanisms in accordance with the Federation Dentaire Internationale (FDI) should be adopted.

**Biological (Cross-Infection) Hazards:** Dentistry is unique in that clinical staff are in direct or indirect contact with traumatized tissues, saliva, and blood on a daily basis.<sup>7</sup> All members of the dental team are at risk of exposure to Hepatitis B virus (HBV), HIV infection, and other types of communicable infections.<sup>15,16</sup> In the United Kingdom for example, the carrier rate HBV in the general population is 0.5%, while dentists have a carrier rate of approximately 1.6%. Several of the common viral agents that can cause hepatitis have been detected in body fluids including saliva and blood. The viruses most commonly implicated include hepatitis A virus (HAV), HBV, and hepatitis C.<sup>16,17</sup> In a study done by Watt HIV/AIDS was believed to be very similar to eye injury and mercurial poisoning in terms of rate of concern amongst dental personnel.<sup>18</sup>



**Legal Hazards:** In every country there are relevant statutes and regulations which apply to the practice of dentistry. The contravention of any of these may warrant that legal actions be brought against a dental practitioner particularly in developed countries where the citizens appear more aware of their rights.<sup>13</sup> To help assure a safe work environment in dental treatment, the hazard awareness and prevention of legal risks should be made known to all clinical workers of the dental hospital.



This study was aimed at assessing and increasing the level of awareness of occupational hazards among clinical dental staff at a dental hospital in Nigeria. This was done by identifying hazards and making recommendations to prevent them.

### Materials and Methods

The study was conducted at the Dental Hospital of the Obafemi Awolowo University Teaching Hospital Complex, Ile – Ife in Osun State, Nigeria. The study population consisted of dentists, nurses, dental surgery assistants, and therapists. An original list of 40 clinical staff participants was created for the study. Thirty-eight clinical staff responded to the study giving a response rate of 95%.

Data was obtained through the use of self-administered questionnaires that included questions on personal data, awareness to occupational hazards, seminar attendance, possession of health insurance policy, safety measures practiced, and experience of occupational hazard while in practice.

Data was analyzed using frequency tables to display the responses of the dental staff. Where necessary, cross tabulations were carried out to determine the significant difference between variables.

### Results

The age distribution of the staff ranged from 26 years to 56 years. The age range of 31-45 years had the highest frequency (22.5%). Twenty males (50%) and 18 females (45%) responded to the study.

The Department of Preventive Dentistry had the greatest number of staff with 14 members (35%). The majority of the staff have been employed from 1 to 15 years (67.5%). (Table 1)

All responding dental personnel (38 or 100%) were aware of occupational hazards occurring in the workplace. As shown in Table 2, more staff (27 or 71.1%) had attended workshops/seminars on the subject than those who have never attended. Most of the staff (except 5 or 13.2%) do not have a health insurance policy. Twenty six dental personnel (68.4%) had been vaccinated against Hepatitis B infection, with significantly more doc-

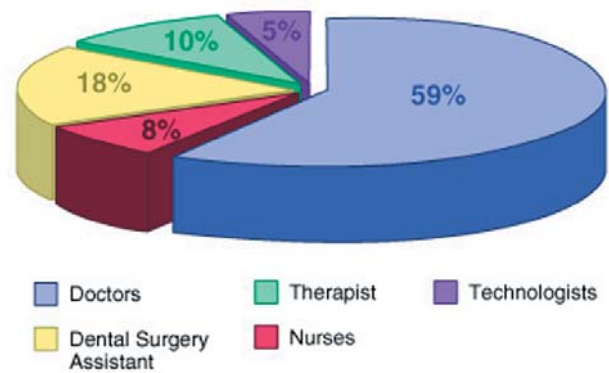


Figure 1. Professional Category of the Dental Staff.

tors (24) than non-doctors having been vaccinated ( $\chi^2= 30.1, P<.001$ ). Fourteen members of the staff (35%) had experienced an injury from a sharp instrument in the past six months.

Table 2 shows 27 staff members (71.1%) had regular exposure to dental amalgam.

Figure 1 represents the professional categories of the clinical dental staff with the number of doctors in the majority (22 or 58%).

Figure 2 represents the cross infection control mechanisms routinely employed by the clinical dental staff with the wearing of protective eyewear being the least employed.



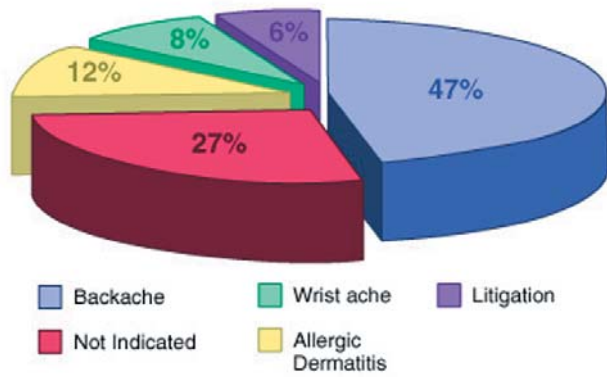
Figure 2. Cross Infection Control Mechanism Routinely Employed.

Table 1. Number of Years in Service.

NUMBER OF YEARS	NUMBER	PERCENTAGE (%)
1-5 YEARS	9	23.7
6-10 YEARS	7	18.4
11-15 YEARS	11	28.9
16-20 YEARS	6	15.8
21-25 YEARS	4	10.5
ABOVE 25 YEARS	1	2.6
<b>TOTAL</b>	<b>38</b>	<b>100</b>

Table 2. Various Responses of the Dental Staff.

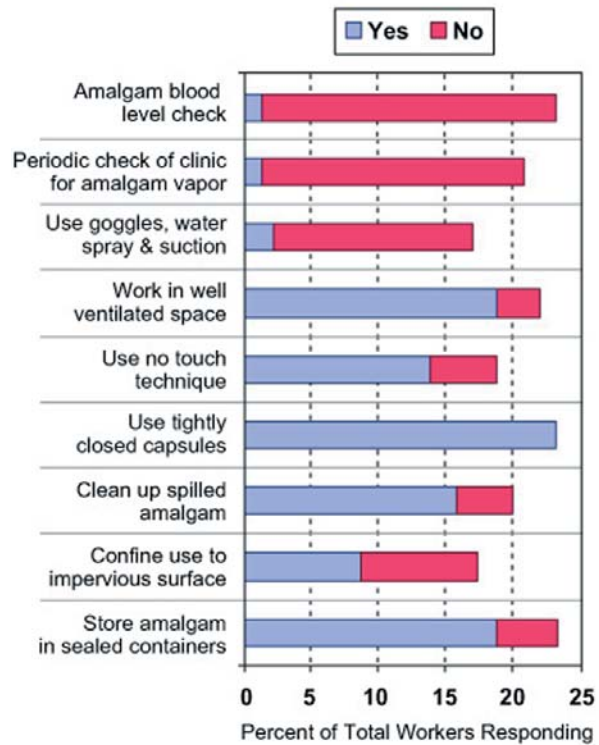
QUESTIONS	NUMBER	PERCENTAGE (%)
<b>Previous attendance at Workshops on Occupational Hazards</b>		
Yes	27	71.1
No	11	28.9
<b>Staff With Health Insurance Policy</b>		
With Policy	5	13.2
Without Policy	33	86.8
<b>Sharp Injury in the Past Six Months</b>		
Yes	14	36.8
No	24	63.2
<b>Previous Hepatitis B Vaccination</b>		
Yes	26	68.4
No	12	31.6
<b>Contact With Amalgam</b>		
Regular	27	71.1
Not Regular	11	28.9



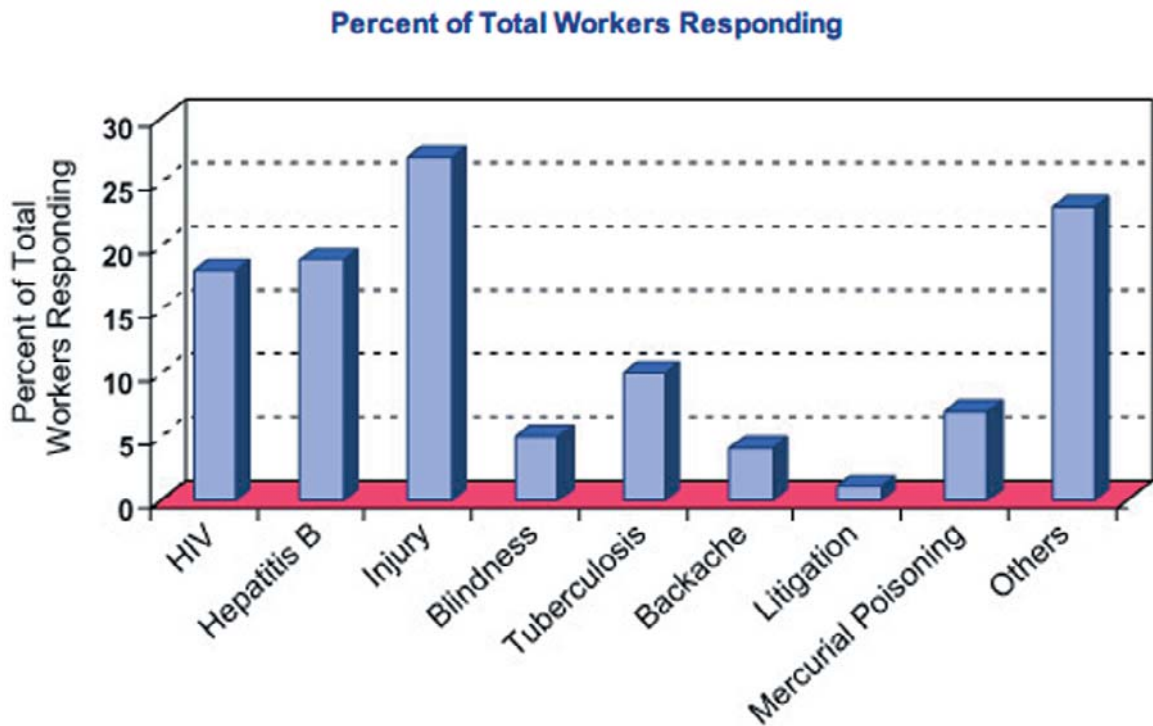
**Figure 3.** Occupational Hazards Experienced by the Dental Staff.

As shown in Figure 3 backache represents the most experienced hazard in 47% of the staff, while Figure 4 represents safety measures adopted by the staff that are regularly exposed to dental amalgam.

Figure 5 demonstrates the dental staffs' level of awareness to different occupational hazards. Most of the staff were aware of being exposed to injury from sharps but very few were aware of legal hazards.



**Figure 4.** Safety Measures Adopted While Handling Amalgam.



**Figure 5.** Level of Awareness of Dental Staff to Different Occupational Hazards.

## Discussion

Bernadino Ramazzini, the father of occupational medicine, published his systematic study of occupational disease in a book in 1713 entitled, "De Morbis Artificum Diatriba," in which he recognized three principal causes of occupational hazards. These would now be referred to as repetitive "strain injuries" and include:

- A fixed working posture
- A continuous repetitive motion
- Psychological stress

Many occupations involve exposure to special and peculiar hazards. The most pernicious are not those where the effects appear immediately, as in accidents, but rather those that run an insidious course over a period of years.<sup>3</sup>



As clinical dental personnel adapt to the workplace and routine functions over a long period of time, they are exposed to potential hazards with the constant handling of potentially dangerous materials and working in a potentially polluted atmosphere. A worker's safety may be severely jeopardized if adequate safety measures are not taken.<sup>2,10</sup>

Health risks in dentistry may arise as new technologies and materials are developed. However, once identified and recognized as risk, new guidelines, precautions, and protocols are often rapidly instituted to greatly reduce or even eliminate the occupational hazard.<sup>13</sup> A good example is the WHO/FDI consensus statement on dental amalgam.<sup>19</sup>

In a survey carried out on the health of dentists in the United Kingdom and United States of America, it was found the most common manifestation of organic disease among this group included backache, hemorrhoids, chronic indigestion, and disease of the circulatory systems. These maladies tend to occur in larger percentages among this group than in the general population.<sup>3</sup> While this present study also observed backache

as being common among dental personnel, the other conditions observed in the American study were not investigated.

In this present study the age distribution of the participating staff ranged from 26 years to 56 years, which is the typical age of the working class in Nigeria. The Department of Preventive Dentistry had the greatest number of staff due to the fact the Department includes pediatric dentistry, orthodontics, periodontology, and community dentistry.

The clinical staffs' level of awareness to occupational hazards was remarkably high. This fact is corroborated by a previous Nigerian study where 88.6% of the dentists surveyed expressed anxiety at the possibility of occupational HIV exposure.<sup>20</sup> However, the high level of awareness was not reflected in the number of staff that had attended workshops on occupational hazards; only a third had attended workshops/seminars on occupational hazards (Table 2). Education is one of the important strategies for the prevention of occupational injuries and diseases. The role of one's occupation as an important factor in maintaining personal health needs to be constantly emphasized so workers understand any possible negative health implications of their jobs and how to minimize them.<sup>21</sup> It was also discovered the majority of the respondents were without health insurance to protect them from financial loss in the event of a job-related injury or health condition.



Although the majority of the participants were aware they were at risk for exposure to injuries from sharps, and hepatitis B infection, not all of them were vaccinated against Hepatitis B infection despite the high risk to the entire dental team.<sup>10,15</sup> It is interesting to note all 24 doctors compared

with only 2 non-doctors had been vaccinated. This is probably a reflection of the attitudes of non-doctors who might feel they are at less risk of exposure and, therefore, do not seek the free vaccine available in the hospital. It is desirable all the staff be vaccinated properly against Hepatitis B infection because of the risk of body fluid borne infection; this is corroborated by the fact more than a third of the dental personnel had experienced an injury by a sharp object in the past six months. Although they were not asked what they did after the injury, an average member of the staff in our hospital now know what to do since the introduction of an HIV policy and the availability of post expositional prophylaxis.

Cross infection control habits among the staff could be rated average because most of the staff appeared to have adopted the guidelines made by the Occupational Safety and Health Administration (OSHA).<sup>22</sup> However, it was discovered very few members of the clinical staff use protective eyewear while attending to patients (Figure 5). The use of protective eyewear is an important means of preventing occupational injury related to the



use of dental curing lights and high-speed rotary instruments. Injury from splatters and projectiles including calculus and flying debris during cavity preparation is a common cause of damage to the eyes, and the use of protective eyewear should be emphasized.<sup>5,6</sup> The cross infection control mechanisms employed by the majority of the clinical staff include ensuring all instruments are sterilized before they are used, changing gloves between patients, use of facemasks, and handwashing before and after gloving. Evidence indicates all of these mechanisms should still be further encouraged as optimal usage has not been achieved (Figure 5).

Approximately 71.1% of the dental clinical staff was in regular contact with amalgam. It was surprising the majority of the staff who handled mercury were unaware they could be exposed to chronic mercurial poisoning. All dental personnel should be alerted of the risk of mercurial poisoning and should be familiar with the preventive measures provided by the FDI against mercurial poisoning.<sup>17</sup> It is advisable to conduct regular mercury vapor level assessments in clinical settings; receive episodic individual amalgam blood level tests; and use goggles, water spray, and suction during the removal of old amalgam restorations.



This study has shown the majority of the staff were aware of the risk of injuries from sharps and needles which is rated to have high occurrence among health workers at least in the United States.<sup>22</sup>

This study is in support of previous studies<sup>3,10</sup> that musculoskeletal health problems were the most common occupational hazards reported by dentists and dental therapists because most of the staff surveyed in this study claim they had acquired backaches from their occupation. The occupationally acquired backache could be due to fixed posture with repetitive movements during patient treatment.<sup>3,10</sup>

It is also important to note from this study very few workers knew of the potential for exposure to legal hazards. This could be because legal actions are not usually brought against health workers in Nigeria unlike developed countries. This may be largely due to lack of awareness on the part of the public. Even where there is awareness, a potential litigant may not be able to afford legal fees.

### Conclusion

In conclusion this study has been able to show that although there appears to be a high level of awareness of exposure to occupational hazards among the clinical staff of a dental hospital in Nigeria, the practical steps to prevent occupational hazards among the staff are still inadequate.

Backache was the most common form of occupational hazard encountered by this group of clinical dental staff members. There is a need to further clarify the specific procedures and postures predisposing to backache and to improve employee training in order to alleviate the occurrence of musculoskeletal health problems.

Apparently the risk issues facing the dental staff in developing countries are very similar to those previously reported in the literature. However, this group of dental care providers also faces issues unique to their situation. It is, therefore, recommended regular workshops and seminars on occupational hazards be organized for all clinical dental staff periodically to update their knowledge and, hopefully, influence their work practices. More effort should be made by management officials to educate the staff about the importance of Hepatitis B vaccination. All staff members should also be alerted to the danger of chronic mercurial poisoning and its prevention.



### References

1. Oxford English Dictionary. Ed JA Simpson and ESC Weiner. 2nd ed. Oxford: Clarendon Press 1989.
2. Asuzu MC. Occupational health: A Summary, introduction, and outline of principle. Ibadan. Afrika-Links Books, 1994: 1-11.
3. Emslie RD. Occupational hazard in dentistry. Dental update 1982; Jan- Feb 5-6.
4. Hauman CHJ. Infection control in the dental surgery. Dental update, October, 1995; 12-16.
5. Eriksen P, Moscato PM, Franks JK, et. al. Optical hazard evaluation of dental curing lights. Community Dent Oral Epidemiol. 1987 Aug;15(4):197-201.
6. Palenik CJ. Eye protection in dental laboratories. J Dent Technol. 1997 Sep;14(7):22-6.
7. Hovius M. Disinfection and sterilisation: the duties and responsibilities of dentists and dental hygienists. Int Dent J. 1992 Aug;42(4):241-4.
8. Hensten-Petersen A, Jacobsen N. The role of biomaterials as occupational hazards in dentistry. Int Dent J. 1990 Jun;40(3):159-66. Review.
9. Kostyniak PJ. Mercury as a potential hazard for the dental practitioner. N Y State Dent J. 1998 Apr;64(4):40-3. Review.
10. Ogunbodede EO. Occupational hazards and safety in dental practice. Nigerian J Med. 1996; 5: 11-15.
11. Field EA. The use of powdered gloves in dental practice: a cause for concern? J Dent. 1997 May-Jul;25(3-4):209-14.
12. Aremo BT. Occupational hazards among Nurses of OAUTHC Ile – Ife. MB.Ch.B Community Health Dissertation Obafemi Awolowo University, Ile – Ife Feb 2001.
13. Babich S, Burakott RP. Occupational hazards of dentistry. A review of literature from 1990. N Y State Dent J. 1997 Oct;63(8):26-31. Review.
14. Yagiela JA. Health hazards and nitrous oxide: a time for reappraisal. Anesth Prog. 1991 Jan-Feb;38(1): 1-11. Review.
15. de Almeida OP, Scully C, Jorges J. Hepatitis B vaccination and infection control in Brazilian dental practice, 1990. Community Dent Oral Epidemiol. 1991 Aug;19(4):225-7.
16. Fagan EA, Partridge M, Sowray JH, et. al. Review of hepatitis non-A, non-B: the potential hazards in dental care. Oral Surg Oral Med Oral Pathol. 1988 Feb;65(2):167-71. Review.
17. Lodi G, Bez C, Porter SR, et. al. Infectious hepatitis C, hepatitis G, and TT virus: review and implications for dentists. Spec Care Dentist. 2002 Mar-Apr;22(2):53-8. Review.

18. Watt RG, Croucher R. Dentists' perceptions of HIV/AIDS as an occupational hazard: a qualitative investigation. *Int Dent J.* 1991 Oct;41(5):259-64.
19. WHO/FDI Consensus Statement on Dental Amalgam. FDI World Dental Federation, September 1997.
20. Sote EO. AIDS and infection control: experiences, attitudes, knowledge and perception of occupational hazards among Nigerian dentists. *Afr Dent J.* 1992;6:1-7.
21. Ojo O. Occupational health hazards among bakery workers in Ile – Ife. M.B.Ch.B Community health Dissertation Obafemi Awolowo Universty, Ile – Ife. Feb 2001; 1
22. Gonzalez YM. Occupational diseases in dentistry. Introduction and epidemiology. *N Y State Dent J.* 1998 Apr;64(4):26-8.

### About the Authors

**Adebola Fasunloro, BChD**



Dr. Fasunloro is presently an intern at the Dental Hospital of the Obafemi Awolowo University Teaching Hospital in Ile-Ife, Nigeria. Her areas of interest are occupational hazards in dentistry and dental radiology.

**Foluso John Owotade, BChD, FWACS**



Dr. Owotade is a Senior Lecturer in the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Obafemi Awolowo University, and an honorary consulting oral and maxillofacial surgeon to the Obafemi Awolowo University Teaching Hospital in Ile-Ife, Nigeria. His research interests include surgical problems, management of HIV/AIDS patients, impacted third molars and their associated problems, as well as temporomandibular joint disorders.

e-mail: [folu\\_owotade@yahoo.com](mailto:folu_owotade@yahoo.com)