
Navigating Biological Health Hazards in Dentistry: Understanding Risks and Ensuring Safety

Nitika Naryal¹, Vinay Bhardwaj², Shailee Fotedar³,
Arun Singh Thakur⁴, Shelja Vashisth⁵

¹2nd Year, Post-graduate Student, Department of Public Health Dentistry, H.P. Government Dental College & Hospital, Shimla, ²Professor & Head, Department of Public Health Dentistry, H.P. Government Dental College & Hospital, Shimla, ³Professor, Department of Public Health Dentistry, H.P. Government Dental College & Hospital, Shimla, ⁴Assistant Professor, Department of Public Health Dentistry, H.P. Government Dental College & Hospital, Shimla, ⁵Assistant Professor, Department of Public Health Dentistry, H.P. Government Dental College & Hospital, Shimla.

How to cite this article: Nitika Naryal, Vinay Bhardwaj, Shailee Fotedar et. al. Navigating Biological Health Hazards in Dentistry: Understanding Risks and Ensuring Safety. Indian Journal of Public Health Research and Development / Vol. 16 No. 2, April-June 2025.

Abstract

Occupational hazards can be defined as a risk to a person usually arising out of employment. It can also refer to a work, material, substance, process or situation that predispose or itself causes accidents or diseases at work place. The history of occupational hazard awareness can be traced back to the 18th century when “Bernadine Ramazzini”, who is referred to as the “Father of occupational medicine”, recognized the role of occupation in the dynamics of health and disease. Dental practice encompasses a diverse range of services to patients of all ages, aimed at preventing, diagnosing, and treating oral diseases and conditions. However, the practice of dentistry also entails exposure to various biological hazards that can pose risks to the health and safety of dental personnel. Therefore, the present review will be an attempt to provide an overview of the different categories of biological hazards faced by dental professionals by examining the various sources, potential health effects, and strategies for mitigation.

Keywords: Biological hazard, Cross-infection, Dentistry, Occupational hazard, Risk

Introduction

Occupation is one of the major determinants of our income, livelihood, life-style, social-interactions and health, but with all kind of work comes certain amount of stress or illness.^[1] Occupational health is an area of work in public health to promote and

maintain the highest degree of physical, mental and social well-being of the workers in all occupations, the prevention of deviation from health among workers caused by their working conditions, their protection from risks resulting from factors adverse to health.^[2] Occupational hazards can be defined as a risk to a person usually arising out of employment. It

Corresponding Author: Nitika Naryal, 2nd Year, Post-graduate Student, Department of Public Health Dentistry, H.P. Government Dental College & Hospital, Shimla.

E-mail: nikiesunvij01@gmail.com

Submission date: June 19, 2024

Acceptance date: August 8, 2024

Published date : March 11, 2025

This is an Open Access journal, and articles are distributed under a Creative Commons license- CC BY-NC 4.0 DEED. This license permits the use, distribution, and reproduction of the work in any medium, provided that proper citation is given to the original work and its source. It allows for attribution, non-commercial use, and the creation of derivative work.

can also refer to a work, material, substance, process or situation that predispose or itself causes accidents or diseases at work place.^[3]

The history of occupational hazard awareness can be traced back to the 18th century when “Bernadine Ramazzini”, who is referred to as the “Father of occupational medicine”, recognized the role of occupation in the dynamics of health and disease. His most important contribution to occupational medicine was his book on occupational diseases, “De Morbis Artificum Diatriba” (Diseases of Workers). He proposed that the physicians should extend the list of questions for their patients by adding, “what is your occupation?”.^[4]

The Occupational Health Research Institute (OHRI) at B. J. Medical college, Ahmedabad was rechristened as “National Institute of Occupational Health” (NIOH) in 1970, is a premier institute under the aegis of Indian Council of Medical Research (ICMR) under the Department of Health Research, Ministry of health and family welfare, Government of India. This institute function as a WHO collaborative and reference centre for occupational health with objectives of promotion of highest quality of occupational health through fundamental and applied research, promotion of intensive research to evaluate environmental stresses/factors at the workplaces and development of technologies and health programmes through basic and fundamental research along with generation of human resources in the field.^[5]

Dental practice encompasses a diverse range of services to patients of all ages, aimed at preventing, diagnosing, and treating oral diseases and conditions. Occupational health and safety in dentistry are paramount to protecting the welfare of dental professionals and promoting a healthy work environment.^[6] However, the practice of dentistry also entails exposure to various biological hazards that can pose risks to the health and safety of dental personnel. Biological hazards can arise from various sources, usually from exposure to infectious agents. Understanding and mitigating these hazards are essential for safeguarding the health and well-being of dental personnel and ensuring the delivery of safe and effective dental care.^[7] This review aims to provide an overview of the different categories

of biological hazards faced by dental professionals by examining the various sources, potential health effects, and strategies for mitigation. The prime objective is to raise awareness about occupational health and safety issues in dentistry and promote best practices for protecting the well-being of dental personnel.

Biohazards in Dentistry

Dentists belong to a professional group potentially exposed to harmful biological factors which most often are infectious microorganisms, less frequently - allergenic or toxic microorganisms contributing to the biological hazards in dentistry. The source of harmful factors is, in most cases, the patient, but it may also be the water used in a dental unit.^[8] There are 4 basic routes of spreading harmful microorganisms in a dental surgery:^[9]

- Blood and body fluid-borne route - through the blood and other body fluid of an infected patient
- Saliva-droplet route - through a droplet aerosol of saliva, gingival fluid, nasopharyngeal secretion or blood emitted by an infected patient, natural organic dust particles (dental caries tissue or filling material) mixed with air and water during the work of both high-speed and low-speed handpieces, scaler and air-water syringe. The aerosol is present not only in the operating field and the space between a patient and a doctor, but is dispersed almost evenly to different parts of a dental office, reaching as far as, 2 meters
- Direct contact with a patient and contaminated equipment
- Water-droplet route - through a water droplet aerosol emitted from a hand piece of a dental unit which may contain microorganisms present in a unit reservoir, or developing in biofilm inside a unit tubing.

Legnani et al^[10] made an assessment of the aerosol contamination resulting from dental procedures. Air contamination was measured by means of the Surface Air System method and the “plate” method (Air Microbial Index). It was proved that during working hours the average air bacterial load increased over three times, and the air load levels were 1.5 times

(aerobic bacteria) and 2 times (anaerobes) greater as compared to the initial load.^[10]

A vast range of microorganisms, from prions

through viruses and bacteria to fungi can spread via any of the above-mentioned routes and cause diseases that are mentioned in the Table 1.

Table 1: Infectious agents causing health hazards

Disease ^[11-23]	Agent	Transmission	General Symptom
Creutzfeldt-Jakob disease	Prion	Saliva-droplet route	Lack of co-ordination, Problems with walking and balance. Impaired thinking, management and judgement. Behavior change, mood swings, anxiety, depression and confusion. Insomnia or changes in sleeping pattern. Unusual sensation Slurred speech. Vision problems.
Hepatitis B	Hepatitis B virus (HBV)	Blood and body fluid-borne route	Initial symptoms are nonspecific- anorexia, nausea, vomiting, abdominal pain, and jaundice. In cases of severe liver damage -jaundice, hepatic encephalopathy, ascites, gastrointestinal bleeding secondary to esophageal varices, coagulopathy, or infections.
Hepatitis C	Hepatitis C virus (HCV)	Blood and body fluid-borne route	Initial symptoms are nonspecific- anorexia, nausea, vomiting, fatigue, malaise, abdominal pain, joint pain and jaundice, dark coloured urine. In cases of severe liver damage - hepatic encephalopathy, ascites, gastrointestinal bleeding secondary to oesophageal varices, coagulopathy, or secondary infections.
Hepatitis D	Hepatitis D virus (HDV)	Blood and body fluid-borne route	Majority of the patients are asymptomatic. Signs and symptoms- fever, abdominal pain, nausea, vomiting, jaundice, confusion, bruising, or bleeding.
Hepatitis G	Hepatitis G virus (HGV)	Blood and body fluid-borne route	Co-infection with HCV.

Continue.....

HIV/AIDS	Human Immunodeficiency Virus (HIV)	Blood and body fluid-borne	In the order of decreasing frequency: Fatigue, Muscle pain, Skin rash, Headache, Sore throat, Swollen lymph nodes, Joint pain, Night sweats, Diarrhoea
Herpes simplex virus-1 infection	Herpes simplex virus-1 (HSV-1)	Saliva-droplet route Direct contact	Most commonly asymptomatic. Symptomatic- "cold sore" or fever blister with pain, halitosis, and dysphagia, malaise, anorexia, fevers, tender lymphadenopathy, localized pain, tenderness, burning, or tingling prior to the onset of mucocutaneous lesions.
Herpes simplex virus-2 infection	Herpes simplex virus-2 (HSV-2)	Saliva-droplet route Direct contact	Genital ulcers, sores, crusts, tender lymphadenopathy, and dysuria, genital itching, irritation, and excoriations
Severe acute respiratory syndrome (SARS)	SARS-Corona Virus (SARS-CoV)	Saliva-droplet route Direct contact	Fever, myalgia, weakness, dry cough, shortness of breath, difficulty breathing.
Tuberculosis (TB)	Mycobacterium tuberculosis	Saliva-droplet route ("droplet nuclei")	Chronic cough, haemoptysis, weight loss, low-grade fever, and night sweats
Legionellosis	Legionella pneumophila Legionella bozemanii Legionella longbeache	Water-droplet route	Fever (high grade), weakness, anorexia, malaise, fatigue, and lethargy; mild and nonproductive cough, haemoptysis, Pleuritic chest pain, abdominal pain, nausea, vomiting, and watery diarrhoea, headache, delirium, confusion, stupor, agitation, and hallucinations.
Candidiasis	Candida albicans Candida tropicalis	Saliva-droplet route	Infection of skin, nails, oral cavity or an endogenous allergic reaction in people with decreased immunity.
Pneumonia	Pneumocystis carinii	Saliva-droplet route	Dry cough, fever with sweats, difficulty in taking a deep breath and haemoptysis

Recommended safe practice guidelines for the prevention of Biohazard

Administrative control - Infection prevention must be made a priority in any dental health care setting. The next level of controls includes administrative controls. Because it is not always possible to eliminate or control the hazard at the

source, administrative controls are frequently used for biological hazards in healthcare. Administrative controls focus on ensuring that the appropriate prevention steps are taken, that all proper work procedures are documented, that dental personnel are trained to use the proper procedures, and that their use is enforced.^[24]

The following key administrative recommendations for dental settings should be followed:[24]

- Develop and maintain infection prevention and occupational health programs.
- Provide supplies necessary for adherence to Standard Precautions (e.g., hand hygiene products, safer devices to reduce percutaneous injuries, personal protective equipment).
- Assign at least one individual trained in infection prevention responsibility for coordinating the program.
- Develop and maintain written infection prevention policies and procedures appropriate for the services provided by the facility and based on evidence-based guidelines, regulations, or standards.
- Facility should have system for early detection and management of potentially infectious persons at initial points of patient encounter.

Infection prevention education and training to dental health care professionals—To guarantee that infection prevention policies and procedures are comprehended and adhered to, education and training are essential. All dental practitioners should get education on the fundamental ideas and procedures for stopping the spread of infections. Dental staff safety (such as OSHA bloodborne pathogens training) and patient safety (such as highlighting job- or task-specific needs) should both be covered in training. At the very least, once a year, at the setting's orientation, and if new duties or processes are introduced, education and training should be given. Training records have to be kept up to date in compliance with federal and state regulations.[24,26]

Dental health care personnel safety - Additionally, infection prevention programs should address occupational health needs, such as vaccination against diseases common to dental professionals (e.g., varicella, chickenpox, tetanus, diphtheria, and pertussis), hepatitis B, MMR (measles, mumps, and rubella), and Tdap (tetanus, diphtheria, and pertussis). They should also manage exposures or infections in personnel requiring post-exposure

prophylaxis, screen for tuberculosis (TB) upon hiring, regardless of the setting's risk classification, and adhere to OSHA bloodborne pathogens standards. Medical service referral agreements can be established with licensed healthcare providers in a hospital's occupational health programme, with educational establishments, or with healthcare facilities that provide staff health services.[25,26]

Standard precautions— They are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered. These practices are designed to both protect dental professional and prevent them from spreading infections among patients. Standard Precautions include: hand hygiene, use of personal protective equipment, respiratory hygiene/cough etiquette, sharps safety (engineering and work practice controls), safe injection practices (i.e., aseptic technique for parenteral medications), use of sterile instruments and devices, and maintaining clean and disinfected environmental surfaces.[25]

Alcohol-based hand rub or water and plain soap (hand antisepsis) should be used for routine dental exams and nonsurgical treatments. Antimicrobial soap is designed specifically for use in healthcare facilities. Even though alcohol-based hand rubs work well for hand hygiene in medical settings, it's still best to wash your hands with soap and water if your hands are visibly dirty, after handling objects like instruments, materials, or equipment with your bare hands that could be contaminated with blood, saliva, or respiratory secretions, before and after treating each patient, and both before and after putting on and taking off gloves.[26]

Personal protective equipment (PPE) refers to wearable equipment that is designed to protect an individual from exposure to or contact with infectious agents. PPE that is appropriate for various types of patient interactions and effectively covers personal clothing and skin likely to be soiled with blood, saliva, or other potentially infectious materials (OPIM) should be available. These include gloves, face masks, protective eye wear, face shields, and protective clothing (e.g., reusable or disposable gown, jacket, laboratory coat). Examples of appropriate use of PPE for adherence to standard precautions

include – use of gloves in situations involving possible contact with blood or body fluids, mucous membranes, non-intact skin (e.g., exposed skin that is chapped, abraded, or with dermatitis) or OPIM, use of protective clothing to protect skin and clothing during procedures or activities where contact with blood or body fluids is anticipated, and use of mouth, nose, and eye protection during procedures that are likely to generate splashes or sprays of blood or other body fluids.^[27] Dentists should be trained to select and put on appropriate PPE and remove PPE so that the chance for skin or clothing contamination is reduced. Hand hygiene is always the final step after removing and disposing of PPE. Training should also stress preventing further spread of contamination while wearing PPE by keeping hands away from face, limiting surfaces touched, and removing PPE when leaving work areas.^[27]

Precautions to restrict respiratory secretions in patients and those accompanying who exhibit signs and symptoms of a respiratory illness are included under respiratory hygiene/cough etiquette. These precautions should be taken at the time of admission into the institution and continue during the stay. These include hanging signs at the entrances instructing patients with respiratory infection symptoms to cover their mouths and noses when coughing or sneezing, to use and discard tissues, and to wash their hands after coming into contact with respiratory secretions; providing tissues and no-touch containers for disposing of tissues; offering masks to coughing patients and other symptomatic individuals upon entering the dental setting; and providing space and encouraging individuals with respiratory infection symptoms to sit as far away from others as possible. These patients could be kept apart while they wait for care, if it is an option.^[26]

Most percutaneous injuries (e.g., needlestick, cut with a sharp object) among dentists involve burs, needles, and other sharp instruments. Engineering and work-practice controls are the primary methods to reduce exposures to blood-borne pathogens from sharp instruments and needles. From an occupational health perspective, good engineering controls such as proper design and maintenance of facilities, room design, the use of Sharps with Engineered Sharp Injury Protection (SESIPs), decontamination

of materials and facilities, local and general exhaust system. Effective biological waste containment also contributes to minimize the transmission of infectious agents.^[27]

Examples of safe needle devices that have built-in engineering features include:^[27]

- Needle less connectors for IV delivery systems
- Protected needle IV connectors
- Needles that Retract into a Syringe or Vacuum Tube Holder
- Hinged or Sliding Shields Attached to Syringe
- Self-blunting phlebotomy and winged steel needles
- Blunt Tip Suture Needles
- Retractable finger/heel-stick lancets

Key Recommendations for safe injection practices are:^[26,28]

- Prepare injections using aseptic technique in a clean area.
- Disinfect the rubber septum on a medication vial with alcohol before piercing.
- Do not use needles or syringes for more than one patient (this includes manufactured prefilled syringes and other devices such as insulin pens).
- Medication containers (single and multidose vials, ampules, and bags) are entered with a new needle and new syringe, even when obtaining additional doses for the same patient.
- Use single-dose vials for parenteral medications when possible.
- Do not use single-dose (single-use) medication vials, ampules, and bags or bottles of intravenous solution for more than one patient.
- Do not combine the leftover contents of single-use vials for later use.
- If multidose vials are used dedicate multidose vials to a single patient whenever possible. If multidose vials will be used for more than one patient, they should be restricted to a centralized medication area and should not enter the immediate patient treatment

area (e.g., dental operatory) to prevent inadvertent contamination. If a multidose vial enters the immediate patient treatment area, it should be dedicated for single-patient use and discarded immediately after use. Date multidose vials when first opened and discard within 28 days, unless the manufacturer specifies a shorter or longer date for that opened vial. Do not use fluid infusion or administration sets (e.g., IV bags, tubings, connections) for more than one patient.

Discussion

As dental professionals, we are constantly exposed to various biological hazards that can pose significant health risks. Therefore, it is imperative to understand these risks and implement effective safety measures to protect both ourselves and our patients. Biological health hazards in dentistry primarily include exposure to bloodborne pathogens, respiratory pathogens, and other infectious agents.^[29]

These hazards arise from direct contact with patients' blood, saliva, and other bodily fluids during dental procedures. The most common pathogens include: Hepatitis B and C Viruses (HBV and HCV), Human Immunodeficiency Virus (HIV), Mycobacterium tuberculosis, Influenza and other respiratory viruses, Herpes Simplex Virus (HSV), Candida species.^[29] The primary risks associated with biological hazards in dentistry include: Infection Transmission (Pathogens can be transmitted from patient to dental professional, from professional to patient, and between patients if proper infection control measures are not followed), Occupational Diseases (Dental professionals may develop occupational diseases due to repeated exposure to infectious agents) and Cross-Contamination (Improper sterilization and disinfection practices can lead to cross-contamination between instruments and surfaces).^[29]

To mitigate these risks, a comprehensive approach to infection control and safety is necessary. Some key strategies that should be strictly followed include adherence to standard precautions, which include hand hygiene (use soap and water or alcohol-based hand sanitizers before and after each patient contact), use of personal protective equipment (PPE) such as

gloves, masks, protective eyewear, and gowns should be used appropriately to create a barrier against infectious agents, using EPA-registered disinfectants for surfaces, use of sterilized instruments, proper handling and disposal of sharps and waste, aerosol management using high-volume evacuation systems, good ventilation, and rubber dams, vaccination against common infectious diseases like hepatitis B and influenza, regular training and education programs for dental staff on the latest infection control practices and guidelines, establishing and following protocols for managing exposure to bloodborne pathogens, including immediate washing of the area, reporting the incident, and seeking medical evaluation, and conducting regular risk assessments to identify potential hazards and update safety protocols accordingly.^[30]

Conclusion

In conclusion, understanding and navigating biological health hazards in dentistry is crucial for ensuring the safety of both dental professionals and patients. By adhering to stringent infection control practices, using appropriate protective measures, and staying informed about the latest guidelines and recommendations, the risks associated with biological hazards in the dental setting can be effectively mitigated so that the highest standards of safety and care can be maintained in dental practice.

Source of Funding: No

Ethical Permission: NA (According to our Institutional guidelines there is no need for an ethical permission for publishing a short commentary or review article).

Conflict of Interest: Nil

References

1. Park K. Occupational health. Park's Text Book of preventive and social Medicine. 26th Ed. Banarsidas Bhanot Publishers. pg:708- 723.
2. Asuzu MC. Occupational health: A Summary, introduction, and outline of principle. Ibadan. Afrika-Links Books. 1994. pg:1.
3. Viragi PS, Ankola AV, Hebbal M. Occupational hazards in dentistry-Knowledge attitudes and practices of dental practitioners in Belgaum city. J Pier Fauch Acad. 2013; 27(3):90-4.

4. Franco G. Ramazzini and workers' health. *Lancet*. 1999;354(9181):858-61.
5. Chopra SS, Pandey SS. Occupational hazards among dental surgeons. *Med J Armed Forces India*. 2007; 63(1):23-5.
6. Szymanska J: Occupational hazards of dentistry. *Ann Agric Environ Med*. 1999; 6:13-19.
7. Reddy V, Bennadi D, Satish G, Kura U. Occupational hazards among dentists: A descriptive study. *J Oral Hyg Health*. 2015; 3(185):2332-8.
8. Shaikh H, Shankar S. Occupational hazards in dentistry-A review. *J. Indian Assoc Public Health Dent*. 2011; 9(3): 642-5.
9. Fasunloro A, Owotada FJ. Occupational hazards among clinical dental staff. *J Contem Dent Prac*. 2004; 5(2):1-10.
10. Legnani P, Checchi L, Pelliccioni GA, D'Achille C: Atmospheric contamination during dental procedures. *Quintessence Int*. 1994; 25:435- 9.
11. Gao LP, Shi Q, Xiao K, Wang J, Zhou W, Chen C, Dong XP. The genetic Creutzfeldt-Jakob disease with E200K mutation: analysis of clinical, genetic and laboratory features of 30 Chinese patients. *Sci Rep*. 2019; 9(1):1836.
12. Terrault NA, Lok ASF, McMahon BJ, Chang KM, Hwang JP, Jonas MM, Brown RS, Bzowej NH, Wong JB. Update on prevention, diagnosis, and treatment of chronic hepatitis B: AASLD 2018 hepatitis B guidance. *Hepatology*. 2018; 67(4):1560-1599.
13. Maticicr M, Poljak M, Kramar B, Seme K, Brinovec V, Meglic-Volkar J, Zakotnik B, Skaleric U. Detection of hepatitis C virus RNA from gingival crevicular fluid and its relation to virus presence in saliva. *J. Periodontol*. 2001; 72(1):11-6.
14. Lodi G, Carrassi A, Scully C, Porter SR: Hepatitis G virus: Relevance to oral health care. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 1999; 88:568-572.
15. Brew BJ, Garber JY. Neurologic sequelae of primary HIV infection. *Handb Clin Neurol*. 2018; 152:65-74.
16. Scott DA, Coulter WA, Lamey PJ: Oral shedding of Herpes simplex virus type 1: a review. *J Oral Pathol Med*. 1997; 26:1-7.
17. Fatahzadeh M, Schwartz RA. Human herpes simplex virus infections: epidemiology, pathogenesis, symptomatology, diagnosis, and management. *J Am Acad Dermatol*. 2007; 57(5):737-63.
18. Iranmanesh B, Khalili M, Amiri R, Zartab H, Aflatoonian M. Oral manifestations of COVID-19 disease: A review article. *Dermatol Ther*. 2021; 34(1): e14578.
19. Li RWK, Leung KWC, Sun FCS, Samaranayake LP: Severe Acute Respiratory Syndrome (SARS) and the GDP. Part I: Epidemiology, virology, pathology and general health issues. *Br Dent J*. 2004; 197:77-80.
20. Li RWK, Leung KWC, Sun FCS, Samaranayake LP: Severe Acute Respiratory Syndrome (SARS) and the GDP. Part II: Implications for GDPs. *Br Dent J*. 2004; 197:130-134.
21. Peiris JS. Severe Acute Respiratory Syndrome (SARS). *J Clin Virol*. 2003; 28(3):245-7.
22. Bagg J: Common infectious diseases. *Dent Clin N Am*. 1996; 40:385-393.
23. Terracciano E, Amadori F, Zaratti L, Franco E. Tuberculosis: an ever-present disease but difficult to prevent. *Ig Sanita Pubbl*. 2020; 76(1):59-66.
24. Bolyard EA, Tablan OC, Williams WW, Pearson ML, Shapiro CN, Deitchmann SD. Guideline for infection control in healthcare personnel, 1998. Hospital Infection Control Practices Advisory Committee. *Infect Control Hosp Epidemiol*. 1998; 19(6):407-63.
25. Saccucci M, Ierardo G, Protano C, Vitali M, Polimeni A. How to manage the biological risk in a dental clinic: current and future perspectives. *Minerva Stomatol*. 2017; 66(5):232-39.
26. Centers for Disease Control and Prevention. Guidelines for infection control in dental health-care settings—2003. *MMWR Recomm Rep*. 2003;52(17):1-61. Available at: www.cdc.gov/mmwr/PDF/rr/rr5217.pdf.
27. Jacobsen N, Aasenden R, Hensten-Pettersen A. Occupational health complaints and adverse patient reactions as perceived by personnel in public dentistry. *Community Dent Oral Epidemiol*. 1991; 19(3):155-9.
28. Szymanska J. Microbiological risk factors in dentistry. Current status of knowledge. *Ann Agric Environ Med*. 2005;12(2):157-63.
29. Ayatollahi J, Ayatollahi F, Ardekani AM, Bahrololoomi R, Ayatollahi J, Ayatollahi A et al. Occupational hazards to dental staff. *Dent Res J*. 2012; 9(1):2-7.
30. Willee AW. How to avoid the occupational hazards of dentistry. *Aust Dent J*. 1967; 12(4):348-59.