An-Najah National University
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Medical Waste Disposal and Occupational Health Hazards in Dental Clinics in Nablus District

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Dedication

TO
My Dear Father, Mother

My Lovely Wife

For their Encouragement

With Love and Respect

Acknowledgment

I would like to express my sincere special thanks and gratitude to my supervisors Dr. Mohammed Al Subu and Dr. Issam Al-Khatib for their supervision, encouragement, guidance and help throughout this project. I also would like to express my gratitude and thanks to my colleagues for their support and encouragement and their help during the course of the study.

Last but not least, thanks are due to my family and my wife for their patience and encouragement throughout my graduate study.

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List of Abbreviations

ACD	Allergic Contact Dermatitis
ADA	American Dental Association
AIDS	Acquired Immune Deficiency Syndrome
BMP	Best Management Practice
CAO:	California Association of Orthodontics
CDA	Canadian Dental Association
CDC:	Centers for Disease Control and Prevention
DHCWs	Dental Health – Care Workers
DHHS:	Department of Health and Human Service
DPPEA	Division of Pollution Prevention and Environmental Assistance
EPA:	Environmental Protection Agency
GDPs	General Dental Practices
HBV	Hepatitis B Virus
HCP	Health – Care Personnel
HCWs	Health Care Workers
HSWA	Health and Safety at Work Act
IAOMT	International Academy of Oral Medicine and Toxicology
ICD	Irritant Contact Dermatitis
IDEM	Indian Department of Environmental Management
JCDA:	Journal of Canadian Dental Association
MnTAP:	Minnesota Technical Assistance Program
NEWMOA:	Northeast Waste Management Official Association
NIOSH:	National Institute for Occupational Safety and Health
NZDA:	Dental Council of NewZealand
ODA:	Ontario Dental Association
OPIM:	Other Potentially Infections Material
OSAP	Office Safety and Asepsis Procedures
OSHA:	Occupational Safety and Health Administration
PHC	Primary Health Care
PHS	Public Health Service
RCDSO	Royal College of Dental Surgeons of Ontario
UNCED:	United Nations Conference on the Environment and Development
WHO	World Health Organization

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Abstract

The present study aimed at identifying dental waste techniques and the most common occupational health hazards at dental clinics in Nablus district. Out of a total of 134, clinics working at private and NGO's clinics, 97 were included in this study. A specially designed questionnaire was used. Collected data were then analyzed using SPSS.

With regard to waste disposal, this study showed that the majority of the surveyed clinics dispose medical wastes into general trash (amalgam, 62.9%; sharps, 61.9%). This study showed that 54.6% wear gloves during treatment of patients, 48.5%, wear gloves during amalgam fillings, 36.8% wear masks and 15.8% wear eye protection all the time. HBV vaccination was reported by 74.2%. Stress (37.1%) and headaches (48.4%) were found to be the most common occupational health problems. Sterilization methods still depend on dry heat methods (83.2%) and on 70% alcohol solutions as a disinfectant agent (53.6%). The use of such methods is a strong indication of lack of either knowledge or ignorance by working clinics.

In conclusion, it seems that there is an urgent need for intervention in order to promote awareness of occupational health hazards and their control measures.

Chapter I

Introduction

1.1 General background

Dental professionals are at risk of exposure to numerous biological, chemical, mechanical, physical, and psychosocial workplace hazards. These hazards include, but not limited, to the spectrum of blood borne pathogens, pharmaceuticals and other chemical agents, human factors, ergonomic hazards, noise, vibration, and work place violence (Occupational Safety and Health Administration (OSHA, 2003).

1.1.1 Biological hazards

Dentistry is considered by the practitioners and most of the public as being highly hazardous (Galginatis and Gift, 1980; Weeks, Levy, and Wagner, 1991). Cross infection is of great concern in health care settings and in the dental sector in particular (Ali, 2003). HBV, HCV, and HIV are important blood borne pathogens which should be carefully considered in dental practice (Sabbah and Main, 1999). With the presence of people who are infected with hepatitis B and C and the HIV viruses, cross infection has become a major concern both to the dentist and his patient (Al-Rabeah and Mohamed, 2002). The most common and most investigated cause of the microbiological risks associated with Health Care Workers (HCW) is injuries due to needle (WHO, 2001).

1.1.2 Chemical hazards

The other main hazards in dental care settings are mercury. Most dentists and their assistants are exposed daily to mercury, in particular elemental vapor (Hg°) by handling dental silver amalgam. Of the inhaled vapor, about 80% is absorbed into the blood (Journal of Dentistry, 1997).

Mercury poisoning can result from vapor inhalation, ingestion, injection, or absorption through the skin. Elemental mercury as a vapor has the ability to penetrate the CNS, where it is ionized and trapped, attributing to its significant toxic effects. Elemental mercury is not well absorbed by the GI tract and therefore, when ingested, is only mildly toxic (Schuurs, 2001).

Main signs and symptoms associated with mercury intoxication from elemental mercury include oral cavity disorders, tremor, ataxia, personality change, loss of memory, insomnia, fatigue, depression, headaches, irritability, slowed nerve conduction, weight loss, psychological and distress. Most of these signs and symptoms have been associated with persons with long term occupational exposure to air concentration of mercury greater 50mg/m^3 whose urinary mercury concentration are greater than 100mg/L. Because of the known toxicity of mercury, various agencies have developed limits for mercury vapor in work place air to protect the health of workers (Environmental Health and Related Programs, 1991).

Chronic low level mercury poisoning can manifest it self with a variety of symptoms ranging from physical fatigue to cognitive, dysfunction and depression (The Preventive Dental Health, 1997). Dentists with occupational exposure to mercury score below normal on neurobehavioral tests of motor speed, visual scanning, verbal and visual memory, and vasomotor coordination (Harrison, 1998).

A study of 180 dentists by researchers at Glasgow Royal Infirmary in Scotland found they had up to four times the normal level of mercury in their urine and nails and had more kidney disorders and memory lapses than the general public and Low level exposure from dental amalgams may

also be associated with adverse immunological reactions in individuals with certain major human leukocyte antigen genotypes; further research is needed in this area (Harrison, 1998).

Governments of many developed and developing nations are becoming increasingly aware of the risks to human health and the environment posed by the inappropriate management of mercury and mercury containing wastes, Canadian Dental Association (CDA, 2001). Dental facilities generate a number of waste products that have the potential to be discharged to the wastewater system through dental vacuum suction systems. Certainly mercury – amalgam is the most problematic waste for dental clinics (Kansas, 2002).

1.1.3 Latex sensitivity

In the 1980s the Occupational Safety and Health Administration (OSHA) and the centers for Disease Control and Prevention (CDC) mandated the health care workers (HCWs) wear gloves during patient care to protect themselves and patients from cross infections. Increased glove use to protect against blood borne pathogens resulted in greater number of glove related reactions. Today, most HCWs wear gloves made of latex because latex has excellent physical characteristics including elasticity, tactility, barrier properties, tear resistance, and low cost (Vandewalle, 2003).

Latex gloves have proved effective in preventing transmission of much infectious disease to health care workers. But for some workers, exposure to latex may result in allergic reactions. Reports of such reactions have increased in recent years especially among health care workers (DHHS, 2000).

The use of latex has been associated with adverse reactions. In order to minimize exposure to latex allergens, low protein, and un powdered latex gloves should be considered when latex gloves are chosen, also nylon glove liners for use under latex, rubber or plastic gloves can be used to reduce the possibility of latex allergy (Sabbah and Main, 1999).

1.1.4 Ergonomics and mechanical hazards

Ergonomics is the study of science of workers and their adjustments or adaptation to their working environment. Dental employers and employees can take measures to improve conditions within their own work areas including communication, education, and moderate corrective measures to protect against musculoskeletal disorders arising from repeated strain and stress in dentistry. The greatest number of ergonomic related problems for dental workers occurs in the back, shoulder and neck. Most of these problems are postural in nature, and are not directly related to the accomplishments of the tasks. These can be classified as sustained, non forceful postural problems (Vandewalle, 2003). An increased high frequency of long lasting and wide spread musculo-skeletal symptoms in the neck and shoulder were found among dentists and dental hygienists compared to different group (Akessou and Kristin, 2000).

Ergonomics standards were developed to reduce musculo-skeletal disorders associated with repetitive motion, awkward posture contact stress and other on the job conditions. During the past several years, the dental profession, dental equipment manufacturers, ergonomics, and time motion analysts have modified the design of the dental equipment and instruments, changed the position of patients and practitioners with respect to each other,

modified dental office design and the placement of equipment, and encouraged "four handed dentistry" (Vandewalle, 2003).

Psychological hazards in dentistry have long been considered a stressful occupation. Dentists today, more than ever, feel that they are subject to levels of stress that are unacceptably high job satisfaction, and poor physical and mental health have been Linked to sources of stress among GDPs and hospital dentists. Stress is another hazard to the dentist and other health workers. Dentists are always focused on the clock, trying to finish whatever they're doing in time and often connect to the negative image of their profession (Pappert and Woolston, 2001).

Burn-out is a distinct psychological construct which has a number of features that separate it from occupational stress. Burn out and stresses are highly likely to occur in dentists of all grades and specialties. Higher patient expectations, higher targets for provision of dental care will put increased demands upon dentists. Those in practice can prevent burn out in themselves and their staff with care, recognition and planning.

1.2 Medical wastes in dental clinics

1.2.1 Definitions

Hazardous waste can be defined as any waste containing a substance which may present a danger to the life or health of living organisms when released into the environment. These wastes may both include medical and radioactive wastes (EPA, 2000). Medical wastes can be defined as any wastes coming out of medical care provided in hospitals or in other medical care establishment (WHO, 1983). Infectious or regulated waste is a small subset (estimated to be 3% in hospital and 1-2% in dental offices) of the

total waste to be discarded (WHO, 1983) and is defined as that waste capable of producing an infectious disease-sufficiently contaminated with blood or other body fluids so as to be able to transmit disease (EPA 1986; Palenik CJ. 2003). Sharp waste means any device having acute rigid corners, edges or protuberances capable of cutting or piercing (California Association of Orthodontics CAO, 2002).

1.2.2 Infectious (regulated) medical waste

For dental office, there are five types of regulated waste. All of them possess the capabilities of transmitting infectious disease, and therefore require special handling, storage, and disposal methods. These types are:

1- Bulk (in a liquid or semi liquid form) blood or blood products and other potentially infectious material (OPIM).

2- Items such as a cotton roll saturated with blood/saliva or OPIM which readily release fluids during handling.

3- Pathological waste (e.g. exfoliated or extracted teeth).

4- Used sharps (contaminated items that can penetrate intact skin such as injection needle, scalpel blades, instruments, burs, and broken contaminated glass).

5- Potential sharps: such as anesthetic carpules which can cousin aspirated blood and could break possibly causing injury and exposure (Palenik, 2003).

1.2.3 Non – infectious (non-regulated) dental waste

Other medical waste types from dental offices may include:

1- Elemental Mercury from Bulk mercury containers, spills and spill clean up, empty amalgam capsules from restorative treatment and broken or unusable amalgam capsules from restorative treatment.

2- Scrap amalgam from traps, screens, excess mix and vacuum pump filters.

3- Extracted teeth containing amalgam from dental extractions.

4- Broken thermometers and blood pressure units from accidental breakage.

5- Used X-ray fixer solution from X-ray processing, X-ray developer from X-ray processing and chromium-containing X-ray system cleaners.

6- Lead foils shields and aprons from X-ray processing, protective shields.

7- Chemical, chemical sterilization solutions from sterilization of dental instruments, disinfectants and cleaners from general office cleaning (The Environmentally Responsible Dental Office Vermont State, 1999).

8- Scrap from zinc-based cements.

9- Office waste such as aluminum, glass, news paper and office paper (EPA, 2002).

1.3 Medical waste management

1.3.1 Management of infectious (regulated) wastes

1.3.1.1 Segregation

Infectious waste should be segregated at the point of origin and as soon as possible, packed and labeled by suitable code. (Al-Qaroot, 2001). The majority of soiled items are not regulated waste. For example, used gloves, masks, and gowns are not considered regulated dental waste and thus can be added to the regular trash. The same is true for environmental

barriers (e.g., plastic bags or sheets and aluminum foil) used to cover equipment during treatment (Palenik, 2003; Al-Khatib, 2003).

1.3.1.2 Handling and storage

Safe handling of regulated waste is essential. Written procedures will help in this process. Involved personnel must be informed of the possible health hazards present and trained in appropriate handling, storage, and disposal methods. Of special concern are contaminated sharps, such as needle. The CDC estimates that health care workers sustain nearly 600.000 percuetaneous injuries annually involving contaminated sharps. A disturbing number of exposures go unreported and / or occur while transporting sharps for disposal or placing them into sharps containers (Palenik, 2003).

Figure 1.1 Containers of OSHA of regulated medical waste

As shown in Figure 1.1 containers of OSHA regulated medical waste must be colored red, or they must be labeled. The label must be visible when waste is picked up for disposal. The totals should be sturdy, e.g., tie-on tags or stickers, must have an orange or orange red back ground and

must have the word "Biohazardous" and the biohazard symbol printed on them in a contrasting color (Division of Pollution Prevention and Environmental Assistance -DPPEA, 1997).

The OSHA Blood borne Pathogens Standard contains specific guidelines concerning sharps containers. Sharp containers must be capable of maintaining their impermeability during storage, transport, treatment, and disposal (Palenik, 2003).

Needles, scalpes, reamers, broaches, and other sharp objects that could cause a puncture wound should not be placed in the garbage even if they are sterilized. This type of waste should be placed in a puncture proof container (EPA, 2002).

Proper handling of sharps is essential because personal protective barriers, such as gloves, will not prevent all needle stick accidents. To minimize the potential for exposures, needles should not be recapped, bent, or broken by hand. Sharps (and potential sharps) should be quickly placed into sharps containers after use. Again, such containers are closeable, leak – proof puncture resistant items labeled with a biohazard symbol (see figures 1.2, 1.3 and 1.4) (Palenik, 2003).

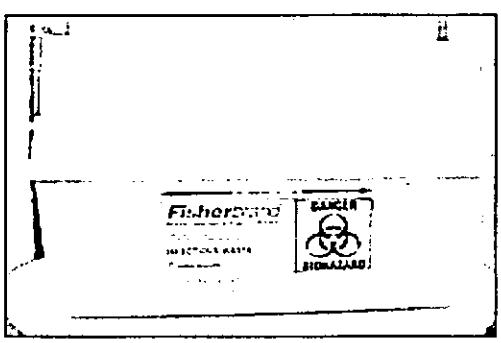

Figure 1.2 Sharp container

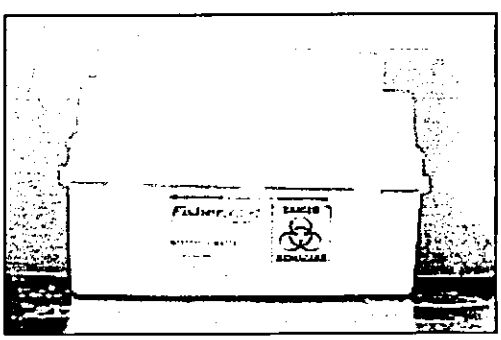

Figure 1.3 Sharp container

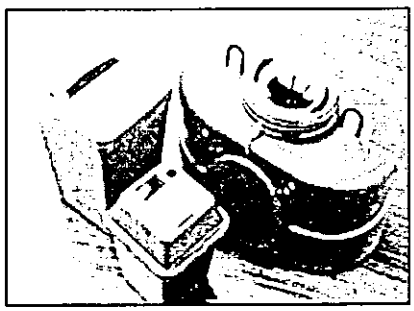

Figure 1.4 Some types of sharp containers

Regulated waste must be stored in a properly ventilated, secured area that cannot be readily seen by patients. Generally, waste should not be stored for more than 30 days. Waste containers must be designed to prevent the development of offensive odors. Usually such items are red and have biohazards symbols attached. Ideally regulated waste should be stored as soon as possible with a minimum of transport. Maintaining bag and container integrity is vital and over filling must be avoided (Palenik, 2003; Al-Katib, and Darwish, 2004; Oregon Dental Association ODA, 2000).

1.3.1.3 On site treatment

Many areas allow in-house treatment of regulated medical/dental waste. An easy and effective procedure is sterilization by moist heat (autoclaving). Dry heat ovens should not be used. Of course, the performance of the sterilizer must be biologically monitored regularly. Where allowed, sharps containers can be sterilized within clinics. The open containers should be placed into the sterilizer in an upright position as shown in figure 1.5 (Palenik, 2003).

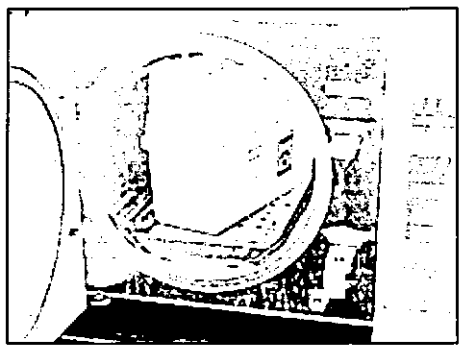

Figure 1.5 Sharp containers on site treatment.

1.3.1.4 Off site treatment

Regulated waste should be removed, neutralized, and disposed in proper way in order to reduce any possible hazards. In developed countries such procedures are carried out by specialized waste companies or run by specialized department under the control of Ministries of Health (Palenik, 2003).

1.3.2 Management of non infectious (non-regulated) wastes

1.3.2.1 Mercury

One major pollutant present in dental waste water is mercury. Mercury is easily transformed in the environment through biological processes to methyl mercury. Methyl mercury is a persistent substance which bioconcentrates in the food chain and is even more harmful than elemental mercury (Sheala, 2000). Amalgams are made up of about 50 percent mercury and some portion of silver, tin, copper and, in some cases, other metals, such as zinc, palladium or indium (City of Boulder – Department of public Health, 2002).

There are several ways that mercury from dental amalgam can get into the environment.

- Waste water: amalgam that is rinsed down drains, any mercury contained in treated waste water will either end up in the sewage sludge or in the liquid effluent to be discharged into lakes or rivers.

- Garbage: if amalgam scrap is discarded into ordinary trash, it may eventually be incinerated or placed in a landfill.

- Antiquated technique: old techniques that use bottle to dispense elemental mercury for amalgam production. This can lead to accidental spills and increase the chance that elemental mercury will end up in the waste stream (The Environmentally Responsible Dental Office Vermont State 1999).

Despite efforts to prepare only the amount of amalgam needed, dentists generally use only about 45 percent of the originally triturated material in the final restoration. Some of the remaining amalgam ends up as large and fine particles in the vacuum system during carving, burnishing, and polishing. During removal of old fillings, all the amalgam in the tooth ends up in the waste stream either as waste or recyclable solid waste in vacuum traps (Municipality of Metropolitan Seattle, 1991).

1.3.2.2 Amalgam (containing mercury and silver) handling procedures

Amalgam waste should be collected, stored and sent for recycling or for disposal at an approved landfill when collection for recycling is not available. Amalgam waste shall not be disposed of in any waste that could be incinerated. Amalgam waste should never be put in with the infectious

(red bag) waste (NZDA, 2001) and never flushed down the drains (City of Boulder – Department of Public Health, 2002).

Mercury should not be incinerated, because when amalgam is burned mercury is released to the atmosphere where it ends up deposited on the ground or in the water. In addition to minimize the amount of mercury vapor emitted to the office environment from waste amalgam, the American Dental Association recommends that it be stored in a closed, airtight container under a small amount of photo graphic fixer (IDEM, 1995).

1.3.2.3 Chair side traps

Chair side traps are beneficial in preventing amalgam from going down the drain which could other wise contribute to waste water pollution (City of Boulder – Department of Public Health, 2002). The control of waste dental amalgam includes proper management of the traps and filters used in vacuum system (The Environmentally Responsible Dental Office Vermont State, 1999). The vacuum system must be flushed with line solution before changing the chair-side trap (Oregon Dental Association, 1998).

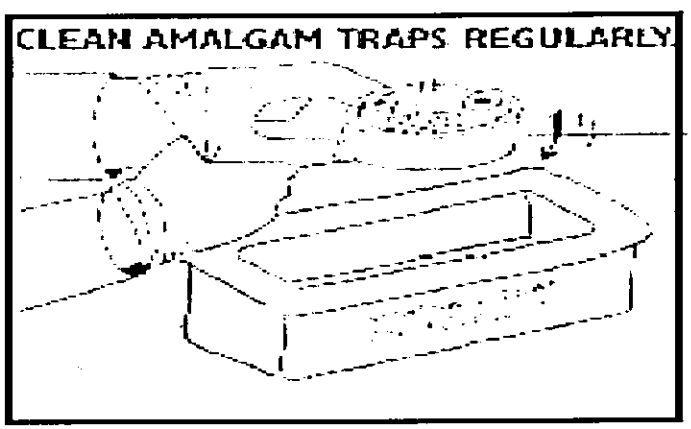

Figure 1.6 Amalgam traps

1.3.2.4 Vacuum pump filters by the central suction pump

Vacuum pump filters must be replaced regularly as recommended by the manufacturers using universal precautions when handling the filters (The Environmentally Responsible Dental Office Vermont State, 1999).

1.3.2.5 Used X-ray fixer solution

Used fixer is the solution left over from X-ray processing and is considered hazardous waste because of it high silver content. Because of its high silver content it is the recommended to recycle the fixer for better management (IDEM, 1995). It is also advisable not to mix X-ray developer and X-ray fixers. Many cleaners for X-ray developer systems contain chromium; chromium is considered a toxic substance that must be managed as a hazardous waste. Cleaning solutions, disinfectant or any other process waste should not be dispose into aseptic system (The Environmentally Responsible Dental Office Vermont State, 1999).

1.3.2.6 Lead containing wastes

Lead is a leachate toxic and can therefore contaminate soil and ground water if it ends up in landfill sites (ODA, 2000). Lead foils, shields and aprons all have a recycle value and they must be labeled and recycled (Kansas SPEAP, 2002).

1.3.2.7 Disinfectant, cleaners and other chemicals

Alcohols, ethers, and peroxides are considered ignitable and must not be discarded down the drain because they could explode. These materials are considered to be hazardous waste. Unused products should be disposed

of through a hazardous waste hauler and labeled directions should be followed (IDEM 1995).

1.3.2.8 Amalgam separator

An ISO certified amalgam particle separator was effective in removing the amalgam from the waste water (CDA, 2002). Amalgam separators connected to the dental suction system are in use in many countries to reduce amalgam discharge to waste water. Amalgam separators operate using either principles of sedimentation or centrifugation. Studies of the effectiveness of amalgam separators estimate that clinics with a separator have mean mercury discharge levels in wastewater that are approximately 10 percent of levels in clinics without a separator. Most of these studies have evaluated sedimentation separators (NZDA, 2001).

Recent certification tests have shown that the installation of ISO - 11143 - certified amalgam separators can attain on efficiency of at least 95% removal of amalgam based on mass fraction (CDA, 2001).

1.4 Infection control practices for the dental office

1.4.1 Universal precautions

Since not all patients with infectious disease can be identified by medical history, physical examination or readily available laboratory tests, the CDC has introduced the concept of universal precautions. This refers to avoid a method of infection control in which human blood and certain human body fluids (saliva in dentistry) are treated as if known to be infectious for HIV, HBV and other blood borne pathogens. Universal

precautions mean that the same infection control procedures are used for all patients (ADA, 2003). An example is shown in figure 1.7.

Figure 1.7 Using of universal precautions.

The CDC recommends that blood, saliva and gingival fluids from all dental patients should be considered as infectious materials (CDC, 2001).

Recent concerns regarding the possible spread of blood born diseases in the dental setting have prompted practitioners to reassesses and update their infection control measures (RCDSO, 2002).

Dental personnel may be exposed to a wide variety of microorganisms in the blood, saliva or respiratory secretion (Sabbah and Main, 1999; CDC 1986). These microorganisms may cause infections disease such as the common cold, pneumonia, tuberculosis, herpes, hepatitis B (HBV), hepatitis (HCV) and human immunodeficiency virus. Infection can be transmitted through several routes, including: direct contact with blood, oral fluids, or other secretions; indirect contact with airborne contaminants present in either droplet splatter, or aerosols of oral and / or respiratory fluids (Sabbah and Main, 1999; Mousa, Mohamoud and Tag El-Din, 1997).

The incidence of hepatitis B and the prevalence of the carrier are increasing. It is believed that in the United Kingdom general dental practitioners treat as many as 250 carriers each day, and in many cases these carriers are not identified. Dental health care workers are at a substantial risk for acquiring hepatitis B if exposed to infected patients blood via puncture injury membrane, or non intact skin exposure (CDC, 2001). Recent literature suggests that the likelihood of contracting AIDS in the dental office is very small, following universal precautions would make the probability of HIV transmission in dental practice extremely low. Universal precautions are also needed to prevent transmission of other blood borne pathogens such as HBV and HCV, along with vaccination for HBV (Sabbah and Main, 1999). Recent studies showed that the prevalence of HBV in Palestine range between 3-5% (MOH, 2003).

1.4.2 Hepatitis B vaccination

Dental personnel are known to be at high risk of acquiring hepatitis B from patients. The hepatitis B vaccine is considered to be a safe and effective vaccine that can prevent this disease (Noel, 2002). Hepatitis B immunization and post exposure management are integral components of a complete program to prevent infection following blood borne pathogen exposure and are important elements of workplace safety (PHS, 2001).

It is the policy of the ADA that all dentists and their staffs having patient contact should be vaccinated against hepatitis B. The OSHA standard now requires that employers make the hepatitis B vaccine available to occupationally exposed employees, at the employer's expense, within 10 working days of assignment of tasks that may results in exposure

(ADA, 2003). Compared to other health care providers, dental professionals have a lower risk of being infected with HIV, due to the decreased amount of viral load in saliva which contains anti–HIV activity. The chance of transmitting hepatitis B virus (HBV) is about 30% per encounter, whereas the transmission rte of HIV with known contaminated blood is 0.3%. The risk is directly related to the extent of contact with contaminated body fluids (Heir and Ziccardi, 1998).

1.4.3 Protective equipment, devices and clothing

Disposable exam gloves must be warn at all times during patient treatment and must not be washed or decontaminated for reuse. They must be used for each patient regardless of the type of treatment or circumstance (CDC, 2001). Exposure to disinfectants or other chemicals often causes defects in gloves thereby, diminishing their value as effective barriers (Ready *et al.,* 1989). Utility gloves (heavy duty rubber) must be used during clean up procedures when sharp contaminated objects may be encountered.

Face masks should be routinely worn during dental treatments capable of causing splash or splatter. This includes procedures in which there is use of high sped pieces, ultrasonic scalars, manipulation with sharp cutting instruments during periodontal and prophylaxis treatments, spraying air and water into the patient's mouth during treatment and intra oral surgical procedures. Masks should be changed when they become wet, typically between patients (NZDA, 2002). Face masks can help prevent infection from oval respiratory secretions which are a source of transmission for several diseases, including SARS (Ali, 2003; Mousa and Tag El-Din,

1997). The protective mask is a source of contamination because it becomes impregnated with microorganisms after 20 minutes.

Protective eyewear in combination with a mask must be worn to protect the eyes when spatter and splash of body fluids are anticipated and a face shield is not chosen. The OSHA standard specifies that protective eyewear be fitted with solid side shields (ADA, 2003; OSHA, 1991). Protective eyewear is worn to protect eyes and mucous membranes from damage from macroscopic particles, chemical injury and microbial infection. Eyewear must be impact resistant and should have solid side shields to afford peripheral protection (NZDA, 2002).

Gowns, aprons, lab coats, clinic Jackets or similar outer garments, either reusable or disposable, must be worn when clothing or skin is likely to be exposed to body fluids .Protective clothing should be changed when visibly soiled or penetrated by fluids. OSHA requires that these garments not be worn outside the work area and that protective attire be removed and placed in laundry bags or containers that are properly marked after use (ADA, 2003; CDC, 1988).

Rubber dam provide an effective barrier to the spread of disease. The dam, by isolating an area of the mouth, protects dental personnel from exposure to blood, saliva and aspiration of oral micro organism (Sabbah and Main, 1999).

1.4.4 Personal hygiene

Eating, drinking, smoking, applying cosmetics or lip balm, or handling contact lenses is prohibited in the clinics laboratories, and sterilization

areas. Additionally, food and drink may not be stored in these areas. Longer hair must be pulled back to avoid contamination. Hands must be thoroughly washed and dried just before placing gloves, and immediately after removal of gloves. Hands must also be washed immediately after bare handed contact with contaminated objects or surfaces. Hands should be free of rings. Excess moisture and organisms tend to collect under rings, contributing to the development of dermatitis. Individual with open lesions or weeping dermatitis of the hands must refrain from direct patient contact and contact with patient care equipment until the condition is resolved (CDC, 2001).

1.5 Handling of sharp instruments and needles

The safety performance criteria for sharps disposal containers are divided into four areas. First, containers should remain functional during their entire use; they should be durable, leak resistant, and puncture resistant under all normal environment conditions. Second, containers must be accessible to workers who use, maintain, or dispose of sharp devices. This criterion includes sufficient number, sufficient container volume, and safe access to the disposal opening on individual containers. Other important factors include convenient placement and (if necessary) portability of containers with in the work place. Third, containers should be visible to the workers who must use them Containers fill status and warning labels are also important visibility criteria. Fourth, containers designs should accommodate the user, the facility, and the environment (DHHS, 1997). Needles, scalpel blades and other sharp instruments should be handled carefully to prevent injuries. If a patient requires multiple injections over time from single syringe; then the needle should be

recapped between each use to avoid the possibility of a needle stick injury. Needless can be safely recapped by placing the cap in a special holder, by using a forceps or other appropriate instrument to grasp the cap or by simply laying the cap on the instrument tray and then guiding the needle into the cap until the cap can be completely seated. Therefore, when recapping, the cap must not be held in the operator's hand, as this poses a great risk of needle stick injury (ADA, 2003).

Particular care should be taken to avoid needle stick injuries and cuts from sharp items. Needle stick injuries offer the greatest potential for serious cross infection and reseating needle increases the risk of unintentional needle stick injuries. Gloves do not provide protection against this injury (NZDA, 2002). Burs on hand pieces are also a potential source of puncture exposure to the patient's body fluids. Hand pieces should be hung upside – down on the cart, with bur pointed away from both the operator and assistant. Alternatively, burs may be removed from the hand piece when not in use (CDC, 2001). For people who have not had prior Hepatitis B vaccination or post exposure prophylaxis, the risk of hepatitis B infection following parenteral (i.e., needle stick or cut) exposure from an individual who is Hepatitis B – positive is 6% - 30%. The risk of infection with HCV following one needle stick exposure to blood from a patient known to be infected with HCV is approximately 30-10%; for HIV, the risk is even lower at 0.3% (Sabbah and Main, 1999).

The factors most often related to sharps injuries include the following:

1- Inadequate design or inappropriate placement of the sharp disposal container.

2- Overfilling of sharps disposal containers.

3- Inappropriate sharps disposal practices by the user during patients care (DHHS, 1997).

1.6 Sterilization of dental instruments

1.6.1 Definitions

The elimination of infectious agents from instruments and equipment is of paramount importance in preventing the transmission of infection. The reduction in the number of pathogenic microorganisms to their lowest possible level is the foundation of an infection control strategy. This elimination involves decontamination, sterilization and disinfection (NZDA, 2002). Decontamination must occur prior to disinfection or sterilization procedures. Cleaning is the basic first step for all decontamination. When you clean, you physically remove debris and reduce the number of microorganisms present.

1.6.2 Sterilization or disinfection of instruments

As with other medical and surgical instruments, dental instruments are classified into three categories. These were classified as critical, semi critical, or non critical depending on their risk of transmitting infection and the need to sterilize them between uses.

Surgical and other instruments used to penetrate soft tissue or bone is classified as critical and should be sterilized after each use. These devices include forceps, scalpels, bone chisels, scalars, and burs (CDC 1993). Semi critical items are those instruments that come in contact with intact mucous membranes, e.g., air / water syringes, amalgam carriers...etc. Non critical

instruments or medical devices such as external components of X–ray heads that come into contact only with intact skin, but not with mucous membranes e.g., mixing slabs, spatulas, etc...are classified as non critical (Sabbah and Main, 1999; CDC, 1993). Tables 1.1, 1.2 show the guidelines and recommended conditions for sterilizing of dental items.

Table 1.1 Recommended conditions for sterilization.

Method	**Time(min.)**	**Temperature °C**
Steam autoclave		
-Gravity displacement	30	121
-Pre vacuum sterilizer	4	132
Dry Heat		
-Static air	60	170
	120	160
	150	150
-Forced air	12	190
Unsaturated chemical vapor	20	132

Adopted from: Noel, 2002; CDC, 2003

Table 1.2 Recommended methods for sterilization of dental items.

Item	Recommended Method	Alternative Method
Amalgam/composite carriers	Wipe with 70% ethyl alcohol	
Articulators	Wipe with 70% ethyl alcohol	
Attachments dental units	Wipe with 2% glutaraldehyde, rinse	Wipe with 70% alcohol
Bracket tables	Wipe with 70% ethyl alcohol, if there is visible blood or pus, clean and disinfect with 0.5% sodium hypochlorite, rinse	
Burs – diamond	Clean with metallic brush and detergent, autoclave	
Dental chairs	Clean with detergent and water, if there is visible blood or pus, clean disinfect with .5% hypochlorite or 2% glutaraldehyde, rinse	
Dental mirrors	Clean with detergent and water, autoclave, store in covered pack or container	
Extraction forceps	Clean with detergent and water, autoclave, store in covered pack or container	
Instrument trays	Clean with detergent and water, autoclave	
Orthodontic bands	Clean with detergent and water, autoclave	
Polishing stones	Clean with detergent and water, autoclave	
Prophylactic cups and brushes	Disposable	Clean with detergent and water autoclave
Root canal instruments	Clean with detergent and water, autoclave, store in covered container	
Suction tube adaptors	Wipe with 70% alcohol after each use. Autoclave weekly	
Surgical instruments	Clean with detergent and water, autoclave, store in covered pack or container	
Syringe local anesthetic	Clean with detergent and water, autoclave, store in covered pack or container	
Wax bite block, wafer	Rinse, immerse in 0.1% sodium hypochlorite for 10 mints., rinse	

Department of Health Infection Control Committee 1993

1.6.3 Commonly used disinfectants in the dental setting

Hypochlorite destroys a wide range of microorganisms and is effective against the Hepatitis B and HIV viruses. Their activity is reduced in the presence of organic matter, and they are corrosive at concentrations necessary for environmental disinfection (NZDA, 2002). It is generally used for several purposes including environmental surfaces (NZDA, 2002).

Alcohol (Isopropanol or Ethanol in 70% - 90%) solution is suitable to rapidly disinfect physically clean surfaces and some clinical equipment. It evaporates quickly leaving the surface dry, but penetrates organic material poorly. Alcohol destroys most viruses but not spores. Contact time should be at least two minutes in necessary to destroy HIV (NZDA, 2002).

Phenolics and ammonium compounds are used mainly in detergents. Microbial kill ability at varying strengths remains difficult to verify; however, their ability to inactivate bacteria through destruction of cell walls is proven. The effectiveness of both is influenced adversely by hard water and soap (NZDA, 2002; Noel, 2002).

1.6.4 Cleaning and disinfection of dental unit and environmental surfaces

After treatment of each patient and at the completion of daily work activities countertops and dental unit surfaces that may have be come contaminated with patient material should be cleaned with disposable toweling, using an appropriate cleaning agent (CDC 1993). Environmental surfaces are all considered non critical and can be divided into clinical contact and housekeeping surfaces as shown in table 1.3 (CDC, 2003).

Table 1.3 Categories of non critical environmental surfaces.

Type of surface	Definition	Examples
Clinical Contact	Surfaces that are directly contacted by contaminated instruments, hands, or gloves.	Light handles, switches, X-ray equipment, containers of dental materials, drawer handles, countertops, pencil, telephone handle, door knob.
House Keeping	Surfaces that require regular cleaning and removal of soil and dust.	Floors, walls and sinks.

Studies have shown that HIV is rapidly inactivated on surfaces after being exposed to commonly used chemical germicides at concentrations lower than those used in practice (CDC, 2003). Low level disinfectants registered with the Environmental Protection Agency (EPA) and Labeled effective against HIV and HBV are appropriate for disinfecting clinical contact surfaces. In the absence of visible blood, complete inactivation of herpes simplex virus can b achieved within 30 seconds with a diluted hypochlorite solution (1:10 or 1:100), a phenolic, or ammonium compound. HBV is rapidly inactivated with a variety of germicides, including ammonium compounds (CDC, 2003).

1.6.5 Impressions, prostheses, casts, wax rims, jaw relation records

Items such as impressions, jaw relation records, casts, prosthetic restorations and devices that have been in the patient's mouth should be properly disinfected prior to shipment to a dental laboratory. Disinfected impressions should be labeled as such in order to prevent duplication of the disinfection protocol (JADA, 1996). Table 1.4 shows mostly used disinfectant methods.

Table 1.4 Disinfection of prosthesis, casts wax, rims

MATERIAL	METHOD
Stone casts	Spray or immerse in hypochlorite or iodophor
Fixed (Metal / Porcelain)	Immerse in glutarldehyde
Removable dentures -Acrylic Porcelain	Immerse in iodophors or chlorine compounds
Removable Partials (Acrylic / Metal)	Immerse in iodophors or chlorine compounds
Wax Rims / Bites	Spray, wipe, spray with iodophors

Adopted from: JADA, 1996

1.6.6 Suction units

When using suction units ensure intermittent, thorough flushing through of suction lines with water during treatment to prevent coagulation, use disposable or freshly sterilized suction tips for each new patient and ensure high speed suction tips are placed optimally to minimize aerosols and splashes and to minimize the need for patients rinse their mouth (NOHSC, 1995).

1.6.7 Sterilization of hand pieces

Hand pieces must be sterilized after each patient and cleaned and lubricated as per manufacture's guidelines. Hand pieces should be sterilized and its water lines should be thoroughly flushed between patients at the beginning and end of each day (Tennessee Department of Health, 1996; Sabbah and Main, 1999).

Biofilm is defined as amass of microbes attached to a surface exposed to moisture. Microbial existence in biofilm is very common, for biofilms form just about any where there is a moist, no sterile environment. Both

water borne and human oral microbes have been found in dental unit water, indicating that both the incoming community water and patient's mouths are sources of these microbes (Sabbah and Main, 1999). Current CDC guidelines recommend that all waterlines for syringes and/or hand pieces should be turned on and flushed for several minutes with hand pieces disconnected at the beginning of the day and 20-30 seconds between patients. Sterile cooling and irrigating solutions must be used as an irritant during surgical procedures. This water must be delivered from a source separate from the dental unit. Dental unit water which contains fewer than 200 CFU/ml of heterotrophic mesophilic bacteria is acceptable for use as a coolant or irritant for all non-surgical dental procedures. Dental water delivery systems which are fitted with anti-retraction valves must be checked weekly. Alternatively, systems which provide constant positive pressure may be use (OSAP, 1997).

1.7 Aims of the study

The present study aimed at:

1- Identifying common occupational health hazards among dentists and its prevention.

2- Identifying the dental waste management practices in dental clinics in Nablus District.

Chapter II

Methodology

2.1 Study population, questionnaire and statistical analysis

The total number of the registered dental clinics in Nablus District in the year 2003 was 134 dental clinics spread between institutional and private sectors (Dental Association 2003). These were distributed as Follows:

- 99 clinics are within the city of Nablus and its three refugee camps.
- 35 clinics are in the rural context.

The study included 97 dental clinics and conducted during May to June, 2003, through field visits to the various randomly selected dental clinics. Structured interviews were run with the dentists using a specially designed questionnaire (see appendix A).

The dentists were asked to respond by stating the hazards in an ordinarily fashion according to their perception of its importance. The questionnaire included questions related to demographic data as well as questions related to qualifications, type of clinic, average working hours, vaccination and practices related to waste management and disposal. Details on waste are explained below:

1. Amalgam wastes: questions related to amalgam wastes including average number and size of newly placed amalgam fillings per week, used type and disposal practices.

2. Disinfectants and chemical wastes: questions related to different types of disinfectants and whether they follow instructions of products and way of handling and discarding these solutions.

3. X-ray wastes: questions related to handling and disposal of the used processing solutions.

4. Sharps: this section included data on the presence of puncture-resistant containers in the clinics and how they dispose sharp items and they were asked if they had needle stick injuries during patient's treatment.

5-Separation of dental waste: dentists were asked if they separate hazardous waste.

6- Issues of infection control practice: dentists were asked to answer in the same way concerning the preventive methods they use in addition to the infection control practices. The questionnaire required data on the infection control procedures such as wearing gloves, masks, eye protection, use single cups, rubber dam and vaccination against hepatitis B virus. Items related to occupational health hazards were also included.

Data were analyzed using the statistical program SPSS (Statistical Package for Social Sciences). Frequencies, means and Chi-square tests were utilized.

3.1 Study population

The study population consisted of 97 clinics (72% of total clinics), which was randomly selected out of 134 clinics working in Nablus district, of which 90 were run by male dentists. Table 3.1 shows age distribution of the study population and the majority of dentists (56.8%) ranged in the age group 31-40. It also shows that most of the clinics were based in the city of Nablus (88.7%) and 57.7% were with experience equals or less than 10 years. The mean age of the responding dentists was 36.69 ± 8.26 years.

Table 3.1 Distribution of study population according to place of residence, gender, age groups and years of experience.

	Group	**No. (%)**
Age group/year	<30	16(16.8)
	31-40	54(56.8)
	41-50	16(16.8)
	>50	9(9.5)
Gender	**Gender**	**No. (%)**
	Male	90 (92.8)
	Female	7(7.2)
Place of Work	City	86(88.7)
	Village	9(9.3)
	Refugee Camp	2(2.1)
Experience /year	> 10	56(57.7)
	11-20	28(28.9)
	21-30	6(6.2)
	< 30	7(7.2)

With respect to scientific qualifications, 68(70.1%) of the dentists were general practitioners and 29(29.9%) were with master's degrees (Figure 3.1).

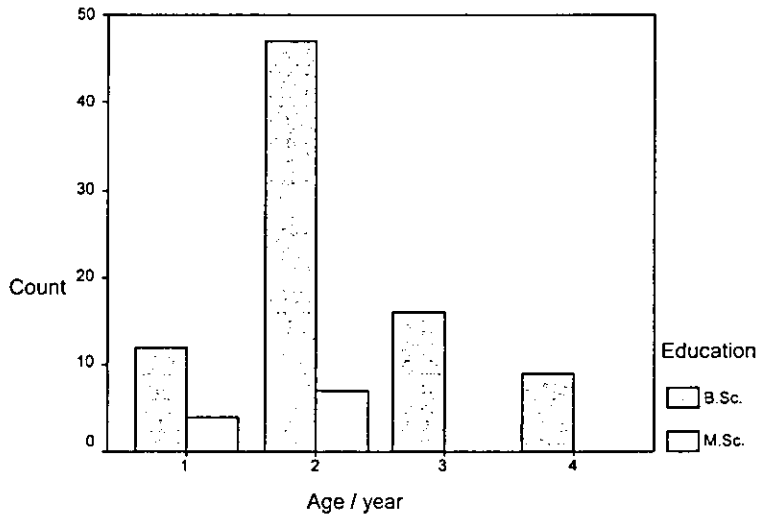

Figure 3.1 Diagrammatic representations of dentist's age and qualifications (1= <30; 2=31-40; 3=41-50; 4=>50years).

3.2 Dental waste disposal

3.2.1 Amalgam restorations and disposal

The most common types of restorations used in the dental clinics were amalgam and composite. Out of 97 surveyed clinics 53(57%) were using amalgam filling and 15(16.1%) were using both restorations (Figure 3.2).

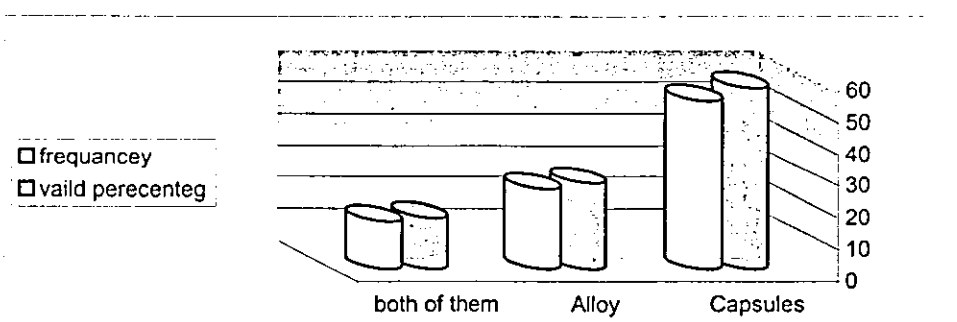

Figure 3.2 Types of used fillings among study population.

Regarding the average number of amalgam fillings conducted per week, small size fillings were with a mean value of 19.07, while medium size of amalgam fillings were with a mean value of 17.57 per week (Table 3.2).

Table 3.2 Average number of amalgam filling used per week

Size of amalgam filling	Number	Minimum	Maximum	Mean
small	89	1	70	19.07
medium	93	1	80	17.57

Disposal of amalgam waste was reported as follows: 61(62.9%) thrown in trash, 22 (23.7%) thrown into the sink and only 10 (10.8%) were disposed in special bottles (Table 3.3).

Table 3.3 Methods of disposing amalgam waste.

Disposing of amalgam filling	**Frequency**	**Valid percentage**
Trash	61	62.9
Drain in sink	22	23.7
Special bottle	10	10.8
	4	Missing data
Total	97	100

The practice of wearing gloves during amalgam fillings was significantly correlated with years of working experience (Chi-square = 70.372, P=.000) as shown in Table 3.4.

Table 3.4 Cross tabulation between wearing gloves and experience

Question		Experience intervals / year				Total
		0-10	11-20	21-30	> 30	
Do you use gloves while filling amalgams	Always	37	10			47
	Nearly always	11	4		4	19
	Often	4	9	4		17
	Seldom			2	3	5
	never	4	5			9
Total		56	28	6	7	97

3.2.2 Disposal of sharps

Table 3.5 indicates that a total of 60(61.9%) of the dentists were disposing sharp items in general trash, 29 (29.9%) were disposing needles and other sharp instruments in safety containers, and 8.2% in plastic bottles. It is important to note that 78(80.4%) of the dentists surveyed were reported to had needle stick injury during treatment of patients.

Table 3.5 Methods of disposing sharps.

Disposing of sharps	Frequency	Valid percentage
Trash	60	61.9
Special containers	29	29.9
Plastic bottle	8	8.2

3.2.3 X-ray waste

Table 3.6 shows that a 47(48.5%) of the dentists surveyed have X-ray units in their clinics. The practice of disposing of radiographic fixer and developer into the sewage system was reported by 47(48.5%) of the dentists surveyed.

Table 3.6 Dental clinics using x-ray

Presence of x-ray in clinics	Frequency	Valid percentage
Yes	47	48.5
No	50	51.5
Total	97	100

When asked about their definition of medical waste, 79% of the responding dentists referred to sharps and gauze and none of them mention the extracted teeth, amalgam waste and x-ray solutions waste.

3.3 Personal protective measures

Table 3.7 shows the practice of wearing gloves, face masks, eye protection during treatment of patients. The percentages of 54.6%, 48.5%, 36.8% and 15.8% were reported to always wear gloves, wear glove during amalgam restoration, wearing face masks and wearing of protective eye glasses, respectively.

Table 3.7 Distribution of dentists according to the repeatedly use of personal protective measures.

	Repeatedly of use				
Measure type	**Always**	**Often**	**Frequency**	**Seldom**	**Never**
	. No.(%)	. No.(%)	. No.(%)	. No.(%)	. No.(%)
Using gloves during treatment	53(54.6)	22(22.7)	18(18.6)	4(4.1)	00(00)
Wearing gloves during amalgam restoration	47(48.5)	19(19.6)	17(17.5)	5(5.2)	9(9.3)
Wearing face masks	35(36.8)	27(28.4)	27(28.4)	6(6.3)	2*
Wearing eye protection	15(15.8)	14(14.7)	24(25.3)	21(22.1)	21(22.1)

* missing

3.4 Sterilization

Figure 3.3 is a diagrammatic representation of the used sterilization methods, where (83.2%) of dental clinics reported to use dry heat sterilization compared to 16 (16.9%) of them who reported to use the vapor sterilizer.

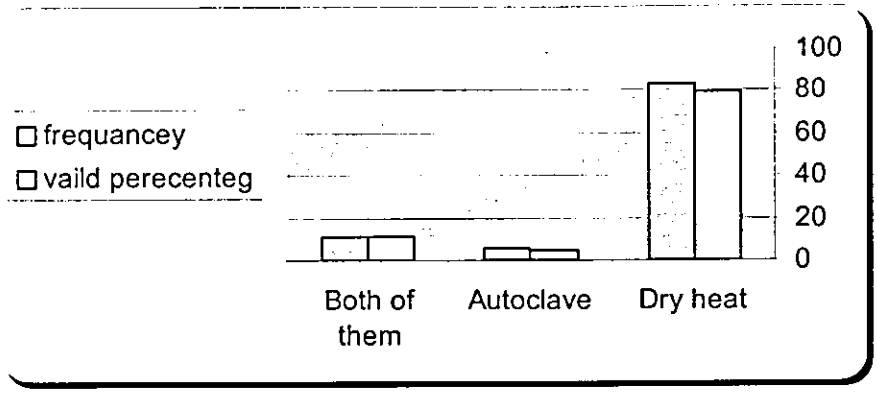

Figure 3.3 Types of used sterilization methods

A total of 84 (86.6) of the dentists sterilized their hand pieces using the disinfectant (Ethyl alcohol) and 40 (48.2%) of dentists reported the sterilization of instruments after each patient.

Table 3.8 shows the different types of used disinfectants in the surveyed dental clinics which included chlorohexidine, 70% alcohol and dettol. Another used disinfectant "Microten" with unknown chemical composition was also reported to be used by 8.2% of the dentists. The percentages of 53.6%, 36.1% and 8.2% were reported for the use of 70% alcohol, chlorohexidine and Dettol, respectively.

Table 3.8 Used disinfectant solutions.

Types of chemical solution	Frequency	Valid Percentage
Glutaraldehyde 1-2%	2	2.1
Clorohexidine	35	36.1
Alcohol 70%	52	53.6
Others (Dettol and Microten)	8	8.2

3.5 Occupational health of dentists

The third part of the questionnaire related to symptoms of adverse health effects among dentists. The dentists were asked if they had any symptoms or signs of adverse health effects. Table 3.9 shows that 2.1% of

the dentists reported that they suffered from bad temper problems. However, several signs and symptoms were reported for numbness (3.2%), low back pain (3.2%), headaches (48.4%), memory loss (4.2%), muscle tremor (2.1%), visual problems (2.1%), allergy 9 (10.0%), blood pressure (3.2%) and stress (37.1%) as shown in table 3.9.

Table 3.9 Different occupational health problem among dentist

Occupational Health problem	**Frequency**	**Valid Percentage**
Headaches	48	48.4
Stress	36	37.1
Muscle tremor	2	2.1
Visual Problems	2	2.1
Skin Allergy	9	10
Gastrointestinal problems	2	2.1
Memory loss	4	4.2
Insomnia	2	2.1
Fatigue	10	10.3
Numbness	3	3.2
Low Back pain	3	3.2
Lack of Concentration	3	3.2
Dizziness	6	6.5

The present study surveyed a randomly selected 97 dental clinics out of 134 clinics in Nablus District. Out of 97 surveyed clinics, 92.6% were run by male dentists, 73.6% were under the age of 40 years, 29.9% were with master's degree and 57.7% were with experience of less than 10 years. This finding indicates an increasing number of young graduates which reflects more attention being paid by the Palestinians towards this profession. The majority of the study population was working in the city in the private sector.

The findings of 57% of the dentists were using amalgam fillings and, part of them is still using elemental mercury, as an alternative, may be due to the fact that patients find other restoration methods more expensive and cannot be afforded especially under the prevailing political situation (Al-Khatib and Darwish, 2004; Darwish, 2002). Such situation seems to push dentists to use cheaper methods for sterilization rather than autoclaving. This can be deduced from the fact that only 16.8% of the clinics have autoclaves and that 83.2% of dental clinics used dry heat for sterilizing dental instruments (see Figure 3.3). The available dry heat systems are not efficient in sterilization of dental instruments, as the minimum temperature required for this purpose should be 170°C for a minimum period of 60 minutes.

The use of dry heat methods and our findings that 32% of dental clinics sterilize dental instruments at a temperature of 140°C for one hour, 50% at 140°C for 30 minutes, and 18% of them sterilize dental instruments at a temperature of 120°C for two hours again support our view of lack of good and efficient sterilization that endanger the health of both patients as

well as dentists through cross contamination. It was also found that only 48.2% of dental clinics sterilize instruments after each patient use, another factor that may contribute to increased risk of infections.

Unfortunately, our findings strongly show that the majority of the surveyed dental clinics were not following the basic principles of dental waste disposal. This assumption is based on the fact that 62.9% of surveyed sample were disposing sharps into trash and do not use special containers for this purpose. This management procedure is very important since a variety of bacterial, viral and fungal microbes are considered as major contaminates of such sharps. Thus, a careless disposal of such objects imposes a high risk not only to dental team and patients, but also to the community in general.

In order to limit cross contamination, dental health care workers must wear operating gloves and other personal protective tools. Our findings showed that 54.6% of the dentists reported always wear gloves, 36.8% reported the wear face masks and 15.8% wear eye protection during treatment of patients. Such finding indicates a lack of implementing required safety measures by the surveyed clinics. This, indicates the urgent need of intervention by the concerned bodies such as the Ministry of Health. The Palestinian situation seems to be moderate compared to some other developing or developed countries. For example, Al – Rabeah (2002) reported that 4% of dental professionals in Saudi Arabia never wear gloves when treating patients. Another study by Moris *et al.,* showed that about 90% of dentists in Kuwait use gloves, 75% use masks and 52% use glasses. A study conducted in New Zealand, (Treasure *et al.,* 1999) showed that 88.2% of dentists wear gloves, 64.8% wear masks and 66.4%

wear eye protection. In 1994, Mc Carthy *et al.,* showed that 91.8% of dentists in Ontario, Canada, always wore gloves, 74.8% always wear masks and 83.6% always wore eye protection. Thus, comparing these finding with our, one can say that more attention should be paid for such practices.

In spite of the importance of HBV vaccination in such sittings, our findings showed that only 74.2% of the dentists had been vaccinated against hepatitis B. The finding of around 75% reported stick needle injuries among the surveyed clinics again emphasizes the need for vaccination as well as the increase of awareness among dentists in the area. Although our situation with respect to vaccination seems to be acceptable compared to reports from Saudi Arabia, it is still lower than that reported vaccination rates from most of the developed countries. For example in 1997, Mc Carthy *et al.,* showed that 92.3% of dentists in Ontario, Canada, had received HBV vaccine, while Gore *et al.*, showed that 88% of dentists in Scotland had a completed course of hepatitis B vaccination. In Saudi Arabia, a survey completed in Government Primary Health Care (PHC) dental clinics on vaccination against hepatitis B found that only 70% of dentists had been vaccinated. Incidence rate for Hepatitis B carriers in Palestine in 2003 is 41.92 per 100,000 and the incidence rate for Hep B cases in Palestine in the year 2003 is 2.76/100,000, unfortunately, no previous studies of such infections were conducted among Palestinian dentists (Ministry of Health).

Practicing dentists had higher levels of mercury in their hair and nail samples and more than four times the level of mercury in their urine that did the academics. While the practicing dentists reported more kidney

disorders and memory problems than did the academics, the conditions were not found to be directly related to higher urinary mercury levels (Health Scout News, 2002; Ali, 2003).

Our findings on the association between wearing of gloves during amalgam restoration and occupational health disease and symptoms were statistically significant. This finding may explain the reported symptoms of bad temper, numbness, headaches, stress, allergy, lack of concentration and muscle tremor among study sample, which might be a consequence of exposure to high levels of mercury. Chi-square and ***P*** values for such signs were as follows: bad temper (Chi-square = 32.791, ***P*** = 0.000), numbness (Chi-square = 63.803, ***P*** = 0.000), headaches (Chi-square = 55.049, ***P*** = 0.000), stress (Chi-square = 12.385, ***P*** = 0.135), allergy (Chi-square = 39.000, ***P*** = 0.000) and lack of concentration (Chi-square = 39.000, ***P*** = 0.000), respectively.

It is of great importance to point out the need for further investigation about mercury blood levels among dentists in order to determine whether such levels constitute any health threats for those in the field.

Recommendations and concluding remarks

The current practices of dental waste management in Nablus district contributes to the contamination of the Palestinian environment and endanger the public health. The majority of surveyed dentists were not aware of the risks they were exposed to and only few of them practiced infection control measures. Thus, efforts are needed at the national level through Ministry of Health, Universities and all concerned bodies in the field in order to tackle such problems and to promote public health awareness. In order to reduce the negative impact of the current situation of dental waste management, and to improve infection control procedures and the occupational health of dentists, the following recommendations can be suggested:

1. More attention should be paid towards the importance of wearing of, gloves, masks and eye protection.

2. Dentists should attend refreshing courses on dental waste management.

3. Dentists must be aware of HBV and other infectious diseases, thus, they must be vaccinated against HBV.

4. Vapor sterilization should be encouraged as an effective method of sterilization.

5. Dental professionals must follow specific guidelines in order to reduce exposure to toxic mercury.

6. Dental care workers must be examined by occupational physicians regularly in order to prevent development of occupational disease.

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" اســـــــتبانـــه "

	المعلومات العامة
V001	رقم الإستبانة _____
V002	عمر الطبيب/ة _____
V003	بلد الدراسة والتخرج _____
V004	الجنس : 1 - ذكر 2- أنثى
V005	1- مكانة الإقامة الدائم : 1- مدينة 2- مخيم 3- قرية
V006	2- مكان العمل: 1- مدينة 2- مخيم 3- قرية
V007	التحصيل العلمي : 1- بكالوريوس 2- ماجستير 3-دكتوراه
V008	3- إذا كان التحصيل العلمي اكثر من بكالوريوس، فما هو التخصص في الدراسات العليا؟
V009	ما هو نوع العيادة التي تعمل فيها: 1- خاصة 2- حكومية 3- أهلية 4-(1+2) 5-(1+3) 6- (2+3) 7- غير ذلك حدد ____
V010	ما هي مدة خبرتك في العمل كطبيب أسنان _____ سنة
V012	ما هو معدل عدد ساعات عملك اليومي _____ ساعة
V013	ما هي مساحة العيادة؟ _____ متر مربع ($م^2$)
V014	هل يوجد نظام تهوية في العيادة 1 - نعم 2- لا (إذا كانت الإجابة لا انتقل إلى سؤال رقم V016)
V015	إذا كان الجواب نعم فما هو نوع التهوية الموجودة في العيادة؟ 1- شبابيك 2 - شفاط 3- (1+2) 4 - غير ذلك حدد
V016	هل تستعمل القفازات أثناء العمل مع المرضى؟ 1- دائماً 2- غالباً 3- أحياناً 4- نادراً 5- ابدا
V017	هل تستعمل القفازات أثناء عمل حشوات الأملغم ؟ 1- دائماً 2- غالباً 3- أحياناً 4- نادراً 5- ابدا
V018	هل تستعمل الكمامات أثناء العمل مع المرضى؟ 1- دائماً 2- غالباً 3- أحياناً 4- نادراً 5- ابدا
V019	هل توفر كاسات البلاستيك للمريض أثناء العلاج؟ 1- دائماً 2- غالباً 3- أحياناً 4- نادراً 5- ابدا

V020	هل تستبدل كاسات البلاستيك مباشرة بعد الانتهاء من علاج المريض؟ 1- دائماً 2- غالباً 3- أحياناً 4- نادراً 5- ابدا
V021	هل تستعمل النظارات الواقية أثناء علاج المرضى؟ 1- دائماً 2- غالباً 3- أحياناً 4- نادراً 5- ابدا
V022	ما هو نوع المعقم المستخدم في العيادة؟1- جافا 2- رطبا 3- (1+2)
V023	ما هو نوع سوائل التعقيم المستعملة في العيادة؟ 1 - Glutaraldehyde 2- Alcohol 70% 3- Detergents 4- Clorohexidine 5- غير ذلك حدد ___
V024	هل يوجد جهاز أشعة في العيادة؟ 1- نعم 2- لا (إذا كان الجواب لا انتقل إلى سؤال رقم V027)
V025	إذا كان الجواب نعم فأين تقوم بتحميض أفلام الأشعة؟ 1- في العيادة 2- في مركز للأشعة خارج العيادة.
V026	كيف تتخلص من سائل تحميض الأفلام؟ الرجاء التفصيل.
V027	اتظف مغسلة كرسي الأسنان 1- بعد كل مريض 2- يومياً 3- أسبوعياً 4- شهرياً 5- لا انظفها ابدا 6- غير ذلك حدد _____
V028	اعقم مغسلة كرسي الأسنان 1- بعد كل مريض 2- يومياً 3- أسبوعياً 4- شهرياً 5- لا انظفها ابدا 6- غير ذلك حدد _____
V029	هل عيادة الأسنان مزودة بفلتر خاص بتصفية الشوائب والمعادن المستعملة في عيادة الأسنان وغيرها ؟ 1- نعم 2- لا
V030	اتتفقد جهاز فلتره كرسي الأسنان Vacuum pump filters ؟ 1- يومياً 2- أسبوعياً 3- شهرياً 4- سنوياً 5- لا اتفقدها ابدا 6- غير ذلك حدد _____
V031	هل تعرف أن مواد تحميض أفلام الأشعة تحتوي على مادة Chromium؟ 1- نعم 2 - لا
V032	هل تقوم بتعقيم All hand instruments؟ 1- نعم 2- لا (انتقل إلى سؤال V034)
V033	إذا كان الجواب نعم، فهل تقوم بذلك:

	بعد كل مريض 2- يومياً 3- أسبوعيا 4- غير ذلك حدد __
V034	هل تقوم بتعقيم hand pieces؟ 1- نعم 2- لا (إذا كانت الإجابة لا انتقل إلى سؤال V036)
V035	إذا كان الجواب نعم، فهل تقوم بذلك: 1- بعد كل مريض 2- يومياً 3- أسبوعيا 4- غير ذلك حدد _____
V036	هل تقوم بتعقيم Syringes؟ 1- نعم 2- لا (إذا كانت الإجابة لا انتقل إلى سؤال V038)
V037	إذا كان الجواب نعم، فهل تقوم بذلك: 1- بعدكل مريض 2- يومياً 3- أسبوعيا 4 - غير ذلك حدد __
V038	هل يوجد لديك معقم؟ 1- نعم 2- لا (إذا كانت الإجابة لا انتقل إلى سؤال رقم V040)
V039	إذا كان الجواب نعم، فما هو نوع المعقم؟ 1- رطبا 2- جافا
V040	على أية درجة حرارة تستعمل المعقم؟ _____ درجة مئوية
V041	هل سبق وأخذت طعم HBV؟ 1- نعم 2- لا
V042	هل سبق وأصبت بوخزة أو بجرح بسبب الأدوات الحادة أثناء معالجة المرضى 1- نعم 2- لا
V043	هل عندك أمراض أو أعراض مرضية أصبت بها – حسب رأيك – لها علاقة بممارستك لمهنة طب الأسنان؟ 1- نعم 2- لا (اذا كان الجواب لا انتقل الى سؤال V045)
V044	إذا كان الجواب نعم، فما هي بالتفصيل؟ _____
V045	هل أصبت بمرض التهاب الكبد الفيروسي نتيجة لجرحك أو وخزك بالإبر أثناء التعامل مع المرضى؟ 1- نعم 2- لا
V046	ما هو نوع الحشوات التي تستخدمها؟ 1- كبسولات 2- الخليط 3-كلاهما
V046A	ما هو تعريف النفايات الطبية حسب وجهة نظرك؟__
V047	ما هو معدل عدد حشوات الأملغم المستخدمة في العيادة أسبوعياً من الحجم الصغير؟ _____
V048	ما معدل حشوات الأملغم أسبوعياً من الحجم المتوسط؟____
V050	كيف تتخلص من بقايا الحشوات الزائدة؟

	1- لمجاري العامة من خلال المغسلة 2- سلة المهملات (القمامة) 3- في حاويات خاصة (علب أو غيرها)
V051	هل يوجد حشوات الأملغم في فمك ؟ 1- نعم 2- لا (إذا كانت الإجابة لا انتقل إلى سؤال رقم V051)
V052	إذا كان الجواب نعم، فكم عددها؟_____
V053	عند إزالة حشوات الأملغم هل تستعمل / تشغيل رشاش الماء البارد بكميات وافرة ؟1- نعم 2 – لا
V054	هل زارك أحد وناقش موضوع طرق التخلص من لنفايات في عيادة الأسنان ؟ 1- نعم 2- لا(إذا كانت الإجابة لا انتقل إلى سؤال رقم V054)
V055	إذا كان الجواب نعم، فإلى أية مؤسسة يتبع هذا الشخص (الفريق)
V056	هل زارك أحد وناقش معك موضوع السلامة المهنية لطبيب الأسنان؟ 1- نعم 2- لا(إذا كانت الإجابة لا انتقل إلى سؤال رقم V056)
V057	إذا كان الجواب نعم، فإلى أية مؤسسة يتبع هذا الشخص (الفريق) ____
V058	تتفحص تاريخ الإنتاج والانتهاء للمواد المستعملة في عيادة الأسنان ؟ 1- نعم دائماً 2- غالباً 3- أحياناً 4- نادراً 5- لا
V059	تأخذ السيرة المرضية لكل مريض؟ 1- نعم دائماً 2- غالباً 3- أحياناً 4- نادراً 5- لا
V060	كيف تتخلص من الأدوات الحادة المستعملة (Sharps) والإبر وغيرها؟ 1- سلة المهملات 2- عبوات خاصة 3- علب المشروبات البلاستيكية الفارغة (علب الكولا مثلا) 4- غير ذلك حدد ____
V061	هل تقوم بفصل النفايات الطبية الملوثة بالدم وغيره عن النفايات العادية غير الملوثة؟ 1- نعم 2- لا
V062	كيف تتخلص من عبوات سوائل التعقيم الفارغة؟
V063	هل لديك فكرة عن كيفية التخلص النهائي من النفايات الطبية الصلبة الناتجة عن عيادة الأسنان؟ 1- قسم خاص للتخلص من النفايات الطبية الصلبة 2- المحرقة 3- مع النفايات العادية 4- غير ذلك حدد

الرجاء وضع علامة (×) أمام أي من الأعراض أو الأمراض التي قد تكون موجودة لديك:

V064	المرض	دائما	غالبا	أحيانا	نادرا	لا يوجد
V065	آلام في الظهر					
V066	مزاج سيئ					
V067	دوخان					
V068	شعور بالتعب					
V069	تنمل (خدران)					
V070	مشاكل في حدة الإبصار					
V071	عدم القدرة على النوم					
V072	ألم في الرأس					
V073	ضعف في التركيز					
V074	ضعف في الذاكرة					
V075	رجف عضلي					
V076	القلق					
V077	عصبي					
V078	مشاكل في السمع					
V079	مشاكل في حدة الإبصار					
V080	أعراض تحسس					
V081	التوتر					
V082	مزاج سيئ					
V083	ضغط دم غير منضبط					
V084	ألم في الصدر					
V085	الاكتئاب					
V086	مشاكل في الجهاز الهضمي					
V087	مشاكل لثوية					
V088	الشقيقة					
V089	مشاكل جلدية					

V090	مشاكل في الحلق					
V091	تقرحات في الفم					
V092	مشاكل في حدة الإبصار					
V093	عدم القدرة على النوم					
V094	هبوط عام					
V095	طعم معدني					
V096	رجف عضلي					

جامعة النجاح الوطنية
كلية الدراسات العليا

طرق التخلص من النفايات الطبية والمخاطر المهنية في عيادات طب الأسنان في محافظة نابلس

اعداد

سالم عدلي محمود مصلح

اشراف

الأستاذ الدكتور محمد السبوع

الدكتور عصام الخطيب

قدمت هذه الأطروحة استكمالا لمتطلبات درجة الماجستير في الصحة العامة بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين

2004

طرق التخلص من النفايات الطبية والمخاطر المهنية في عيادات طب الأسنان في محافظة نابلس

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الملخص

هدفت هذه الدراسة إلى التعرف على واقع أطباء الأسنان في محافظة نابلس من حيث تدابير التخلص من النفايات الطبية والمخاطر المهنية الناتجة عن ممارسة المهنة. تكونت عينة هذه الدراسة من 97 طبيب أسنان من أصل 134 يعملون في عيادات خاصة وأهلية وحكومية في محافظة نابلس حيث كانت نسبة الذكور 92.6%. تم جمع المعلومات باستبانة صممت لهذا الغرض ومن ثم تم تحليل المعلومات باستخدام الرزمه الاحصائية SPSS.

فيما يتعلق بطرق التخلص من النفايات الطبية، بينت هذه الدراسة ان غالبية الاطباء من عينة الدراسة تعمل على التخلص من نفاياتها عن طريق سلة المهملات (بقايا الحشوات 62.9%، الادوات الحادة 61.9%).

وقد بينت نتائج الدراسة كذلك أن 54.6% من أطباء الأسنان يستعملون دائماً القفازات خلال ممارستهم لعملهم، 48.5% يستعملون القفازات أثناء عمل حشوات الأملغم، و36.8% دائماً يضعون الأقنعة الواقية، و15.8% دائماً يضعون النظارات أثناء المعالجة و 74.2% طعموا ضد التهاب الكبد الوبائي نوع ب. كما بينت الدراسة أن 37.1% من أطباء الأسنان يشكون من التوتر و 48.4% يشكون من الصداع. وهذان العرضان هما من اهم المشاكل الصحية لدى اطباء الاسنان. اما فيما يتعلق بوسائل التعقيم المتبعة فقد تبين ان ما نسبته 83.2% منهم يستعملون جهاز التعقيم الحراري الجاف و ان 53.6% يستعملون الكحول

مثل هذه الممارسات لدليل واضح على المعرفة المحدودة او الاهمال في اتباع المعايير السليمة والمتبعة في هذا المجال.

وأخيراً فقد تبين أن طرق التخلص من النفايات الطبية السنية وطرق التعقيم والإجراءات الوقائية وغيرها من السلامة المهنية والصحية المتبعة في معظم عيادات الأسنان في محافظة نابلس لم تكن بالقدر الكافي والفعال لذا لا بد من التدخل السريع من قبل الجهات المعنية بهدف زيادة الوعي الصحي والسلامة المهنية في عيادات طب الاسنان.