**Deanship of Graduate Studies**

**Al-Quds University**

# Assessment of the Infection Control System in Dental Clinics in Hebron District

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**M. Sc. Thesis**

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# Assessment of the Infection Control System in Dental Clinics in Hebron District

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## Thesis Approval

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Jerusalem – Palestine

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# Dedication

**To my dear parents**

**To my dear wife and sons**

**To my dear brothers and sister**

## Declaration

I certify that this thesis submitted for the master degree of public health is the result of my own research, except where otherwise acknowledged, and this thesis has not been submitted for a higher degree to any other universities or institutions.

Adel Ahmad Mohammed Hroub

Signed:……..

Date: 2017/5/13

## Acknowledgment

I would like to thank my supervisor, Dr. Musa Bajali for his supervision, and encouragement through this study.

I would like to thanks the faculty of public health

My special thanks and my greatest appreciation to all those who encouragement me to finish this study.

I wish to express my gratitude to my family.

## Abstract

**Background:** Despite many advances in infection control in the recent years, there are many problems in hospitals, clinics and offices. Dentists are always at high risk for blood-borne infections due to the contact with blood and other body fluids.

**Aim**: To assess the infection control system in dental clinics in Hebron district in Palestine. The study included assessment of the compliance to the infection control guidelines and perceptions for implementing the infection control system from the respondents' perspectives.

**Method**: A quantitative, descriptive, and a cross sectional design in order to assess the infection control program at the dental clinics in Hebron area. Data was collected using a self-administered questionnaire and a check list.

**Findings**: The study involved 116 dentists, seven of them were doctors from the government sector and 109 doctors from the private sector. The response rate was(100%)in the government sector, while it was (93.6%) in the private sector. By the characteristics of the respondents concerning the gender variable, the percentage of the category (Male) is (71.6%), and the percentage of the category (Female) is (28.4%) out of the total number of the sample size. Concerning the age variable, the percentage of the category (less than 30 years) is (14.7%), and the percentage of the category (30-39) is (53.2%), the percentage of the category (40-49) is (23.9%), and the percentage of the category (50 years or more) is (8.3%) out of the total number of the sample size. Concerning the years of experience variable, the percentage of the category (1-3 years) is (9.2%), the percentage of the category (4-5 years) is (14.7%), the percentage of the category (6-10 years) is (35.8%), and the percentage of the category (>10 years) is (40.4%) out of the total number of the sample size. Concerning the educational level variable, the percentage of the category (Specialist) is (16.5%), while the percentage of the category (General) is (83.5%) out of the total number of the sample size. Concerning the ownership variable, the percentage of the category (Public) is (6.4%), while the percentage of the category (Private) is (93.6%) out of the total number of the sample size. Concerning the working hours per week variable, the percentage of the category (<35 hours per week) is (5.5%), while the percentage of the category (35 hours per week) is (26.6%), and the percentage of the category (>35 hours per

week) is (67.9%) out of the total number of the sample size. Only 5.5% of the respondents received infection control training courses in the last two years, only19.3% of the respondents have access to infection control protocol when they need it, while 89.9% of the respondents need to learn more about infection control training protocol, and 19.3% of them think that system enforces implementation of infection control protocol at the clinic.

The respondents positive response to the attitude level for hand washing protocol was(78.2%), and it was (38.53%) for compliance for total hand hygiene. The overall score for attitude with personal protective equipment is 50.21% (mean to the three components, hand gloving 69.95%, masks 67.9%, eye protection 12.8%) . There is high positive attitude response about (80.4%) regarding decontamination and cleaning, also there is a relatively low positive attitude response regarding instruments sterilization which is (42.8%). And it was only (33.11%) for compliance. Most of respondents(15.60% only sterilizes hand pieces) agree that they did not sterilize handpieces following each patient treatment, and they were satisfied cleaning it with alcohol,(sterilization of handpieces is strongly recommended and autoclaving is the preferred method). Most of the dental practitioners(84.4%) seem to be immunized against hepatitis B. Looking for effects of the socioeconomic factors on the infection control system The results show that there are significant differences between males and females in terms of hand washing, decontamination and cleaning, and instruments sterilization (P-values<0.05): females (Mean=4.53) have hand washing more than males(Mean=4.16), females (Mean=4.52) have decontamination and cleaning more than males (Mean=4.06) and females (Mean=3.44) have instruments sterilization more than males (Mean=3.08).This explains the presence of a female instinct commitment to clean more than a male. The overall score for attitude with infection control practices is 65.82%, and for compliance is (44.0595%).

**Conclusion**: The assessment showed that there is a weak proof in the practice of infection control in the Palestinian dental clinics. There is a need to improve the image.

**تقييم نظام مكافحة العدوى في عيادات أمراض الفم والأسنان في محافظة الخليل**

إعداد: عادل احمد محمد حروب
إشراف: د.موسى بجالي

**الملخص**

**الخلفية:** بالرغم من التقدم الذي شهده قطاع مكافحة العدوى في النظام الصحي إلا انه هناك الكثير من المشاكل الذي تؤثر على فاعلية هذا النظام في المستشفيات والعيادات حيث تعتبر خدمات طب الأسنان مصدر خطر كبير لكثير من الأمراض المعدية وانتشار العدوى ويعود ذلك بسبب الاحتكاك المباشر بالدم وسوائل الجسم المختلفة.

**الهدف:** تقييم نظام مكافحة العدوى في عيادات الأسنان في محافظة الخليل وهذا التقييم يشمل مدى الالتزام بالنظام العالمي واخذ النظام الوطني العام بعين الاعتبار (حيث أن نظام مكافحة العدوى في فلسطين وضع بشكل عام ليشمل جميع قطاعات الصحة دون الأخذ بخصوصية كل قطاع) كما ويشمل دراسة العوائق لتنفيذ هذا النظام من وجهة نظر المشاركين.

**الطريقة:** تم استخدام تصميم وصفي مقطعي في 109 عيادات, استهدف جميع الأطباء العاملين في هذه العيادات . تم جمع البيانات باستخدام استبيان.

**النتائج:** شارك في الدراسة 116طبيب أسنان وكان من بينهم سبع أطباء من القطاع الحكومي و109 أطباء من القطاع الخاص وكانت نسبة الاستجابة في القطاع الحكومي (100%) أما في القطاع الخاص فكانت نسبة الاستجابة (93.6%) بالنسبة لخصائص المشاركين فكانت (71.6%) من الذكور و(28.4%) من الإناث أما بالنسبة لمتغير العمر فكانت نسبة الفئة اقل من 30 سنة (14.7%) والفئة من 30–39 (53.2%) والفئة من 40–49 (23.9%) والفئة أكثر من 50 (8.3%) أما متغير الخبرة فكانت الفئة من 1–3 سنوات (9.2%) والفئة من4–5 سنوات فكانت (14.7%) والفئة من6–10 سنوات فكانت (35.8%) والفئة أكثر من 10 سنوات فكانت (40.4%) من المجموع الكلي للعينة التمثيلية , أما متغير مستوى التعليم فكانت (16.5%) من الأخصائيين و(83.5%) أطباء أسنان عام , أما ملكية العيادة فكانت (6.4%) قطاع عام و(93.6%) قطاع خاص , أما متغير ساعات العمل في الأسبوع فكانت (5.5%) يعملون اقل من35 ساعة أُسبوعيا و (26.6%) يعملون 35 ساعة أسبوعيا و(67.9%) يعملون أكثر من 35 ساعة أسبوعيا . (5.5%)

فقط تلقوا دورات تدريبية لمكافحة العدوى في العامين الماضيين (19.5%) لديهم القدرة للوصول إلى نظام مكافحة العدوى مت أرادوا , (89.9%) يعتقدون أنهم بحاجة للتعلم أكثر في هذا المجال (19.3%) يعتقدون انه يوجد نظام يفرض تطبيق بروتوكول مكافحة العدوى في عيادات الأسنان.

ردود الفعل الايجابية إلى مستوى الامتثال لبروتوكول غسل الأيدي كانت (78.2%) , لبروتوكول استعمال القفازات (61.2%), لبروتوكول إزالة التلوث والتنظيف (80.4%) , لبروتوكول التخلص من النفايات (54.6%), لبروتوكول التعقيم (42.8%).

النتيجة الإجمالية للمواقف والخبرة بممارسات مكافحة العدوى 65.82%. ومن بين الحواجز الرئيسية للتقيد بالمبادئ العامة لبروتوكول العدوى هي :قلة التدريب على أسس نظام مكافحة والذي ينتج عنه ضعف الخبرة والمهارات لتطبيق المهارات الضرورية لتطبيق بروتوكولات نظام مكافحة العدوى وضعف الحوافز ونقص الإمدادات والمواد.

أما نتيجة الالتزام الإجمالية فكانت (44.0595%) **وهذا يظهر درجة** عالية من الضعف والتي ظهرت بصورة واضحة على سبيل المثال في أداة إزالة التسويس والذي حازت على نسبة 15.60% من الأطباء الذين يقومون بتعقيمها ضمن المواصفات المطلوبة

أما في البحث عن تأثيرات العوامل الاجتماعية والاقتصادية على نظام السيطرة على العدوى تظهر النتائج وجود فروق ذات دلالة إحصائية بين الذكور والإناث من حيث غسل اليدين وإزالة التلوث والتنظيف وتعقيم الأدوات وذلك لصالح الإناث.

الخلاصة: التقييم اظهر نقاط ضعف واضحة في ممارسة مكافحة العدوى في عيادات الأسنان الفلسطينية. هناك حاجة إلى تحسين الصورة..

## Table of Contents

## List of tables

## List of Figures

## Abbreviations

| | |
|---|---|
| BBV | Blood Borne Viruses |
| HBV | Hepatitis B Virus |
| DHCPs | Dental health care professionals |
| HIV | Human Immunodeficiency Virus |
| HCWs | Health care workers |
| HCV | Hepatitis C Virus |
| PEP | Post-exposure prophylaxis |
| GDPs | General dental practitioners |
| HAI | Healthcare-associated infection |
| CDC | Center for Disease Control and Prevention |
| MOH | Ministry of Health |
| WHO | World Health Organization |
| NGOs | Non-Governmental Organization |
| SPSS | Statistical Package for Social Sciences |
| PDC | Private Dental Clinic |
| GDC | Government Dental Clinic |
| OPIM | Other Potentially Infectious Materials |
| ICM | Infection Control Measures |
| HCP | Health Care Provider |
| PPE | Personal Protective Equipment |
| BDA | British Dental Association |
| ADA | American Dental Association |

# Chapter One
# Introduction

## 1.1 Introduction

Cross infection is one of the most crucial problems in health care service worldwide. It constitutes one of the most important causes of morbidity and mortality associated with clinical, diagnostic and therapeutic procedures.

A wide variety of microorganisms may be present in the saliva, body fluids, vomit and blood of patients. During dental treatment, pathogens may be transmitted through direct contact, trauma, bites, droplets, aerosols, or inoculation by contaminated instruments. Most carriers of infection, including, blood borne viruses (BBV) are unaware of their condition and therefore it is important to know that the same control of infection practice is adopted for all patients ( Altaf H. Shah et al.,2010, CDC.(2007) ).

The dental environment is associated with significant amount of risk for exposure to various microorganisms. There are many infectious diseases that can be transmitted in a dental environment, new diseases with serious consequences and a high rate of transmission have been evolved in the recent years, infection control is directed at prevention to exposure of such infections and also to prevent it from being transferred from a person to another, the universal infection control policy considers that every patient should be considered as infectious (Altaf H. Shah et al.,2010).

In oral health care nosocomial and occupation transmission is the most important mode of transmission that poses a serious risk to dentists and their patients. Blood borne viruses (BBV),including HBV infection which is the most common blood borne pathogen transmitted in the health care settings (Eng-Kiong Teo et al.) . Dentists can help transmitting the virus among their patients or may contract it themselves from their patients. Subsequently, if the medical equipment and tools are not cleaned and then disinfected, properly the chances of transmitting of the infection can be very significant, and if the dentist and their ancillary services deal with these equipment do not use appropriate handling methods (universal/standard precautions) they may accidentally get

exposed to blood or body fluids of patients infected with these pathogens (Werner BG et al. ).

Infection control practices in developing countries have not been widely documented. Some hospitals have no infection control programs due to the lack of awareness of the problem or absence of properly trained personnel. Currently, some developing countries may not have standard instructions or protocols on infection control practice in private dental clinics(Altaf H. Shah et al.,2010, BDA February 2003P, Abdullah Al-Rabeah et al. 2002)

## 1.2 Infection Control Protocol

Worldwide, several organizations have produced protocols for infection control. In the United State of America the centers for disease control and prevention (CDC) is one of the main contributors.

The principles of infection control include standard precautions and transmission based precautions. The standard precautions are the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient in any setting where health care is delivered (Dougherty, L & Lister, S. (2011) CDC.(2007), CDC .(2011).) These precautions are considered to protect the health care personnel and spread of infections among patients by including protocols for:

1- Hand hygiene.
2- Personnel protective equipment.
3- Respiratory hygiene and cough etiquette.
4- Safe injection practices.
5- Safe handling of potentially contaminated equipment,( CDC .(2011)).

The transmission based precaution are intended to support standard precautions in patients with a known or suspected colonization, these additional precautions are used when the route of transmission is not completely interrupted by using standard precautions, and it includes:

1. Contact precaution.
2. Droplet precaution.

3. Airborne precaution,( CDC .(2011) ).

### 1.3 Palestinian Infection Prevention & Control Training Protocol

The production of the Palestinian infection prevention and control training protocol in November 2004 and its subsequent update in July 2010 was intended to protect the health of workers, the clients, the community, and the environment and to strengthen the health care system in Palestine by providing the best appropriate infection prevention and control practices based on the international standards of CDC, world health organization.

The key components of this manual are: proper hand hygiene, wearing gloves, physical barrier usage, using antiseptic agents, using safe work practice, safe disposal of waste materials, process instruments and protection of workers health, (MOH, 2004) .

### 1.4 Problem Statement

Despite many advances in infection control in the recent years, there are many problems in hospitals, clinics and offices. Dentists are always at high risk for blood-borne infections due to contact with blood and other body fluids, so that all dentists, nurses and other health team members are associated with this problem.

Practitioners and most of the public believe that dental procedures are extremely hazardous(This is what I observed and heard from our colleagues in the various medical specialties and many citizens, when I was working in a private clinic for 20 years from 1994 to 2014), such a view might be a result of the negative picture created by the media that depicts dentistry as a profession filled with dangers.

Despite the great success of the Ministry of Health to control and eliminate many diseases, to limit the spread of many communicable diseases in Palestine and the continued control Infectious, the challenge is still there such as Hepatitis and AIDS. 26 cases of Hepatitis B monitoring in 2012 at the rate of occurrence of 6.0 per 100,000 population in the West Bank, while no sort with this disease in Gaza. Until 2012 there were 1158 cases recorded occurred at a rate of 6.26 per 100,000 of the population, including 804 cases in the West

Bank and 354 in Gaza, the cumulative total number of acquired Immunodeficiency Syndrome is 77 cases for 2012, including 64 cases of AIDS and 13 of the carriers.

As the dental profession involves the use of small sharp instruments contaminated with blood or other fluids, there is ample opportunity for inadvertent skin wounds to the operator and staff such accidents including the possibility of transmission of various infectious diseases. Giving the importance of maintaining the health of the dental personnel and the patients and the lack of documented evidence on the status of infection control measures implemented in dental offices in Palestine, this study were carried out to assess the infection control measure and provide information about the current status with a hope to reach the optimum standards of infection control in dental care centers.

### 1.5 Justifications

A dental clinic is an environment where disease transmission occurs easily. Prevention of cross infection in the dental clinic is therefore a crucial aspect of dental practice, and dental clinic workers must adopt certain basic routines while practicing. Dental health care professionals (DHCPs) are at risk of infections caused by various microorganisms such as Mycobacterium tuberculosis, Hepatitis B and Hepatitis C viruses, Staphylococci, Streptococci, Herpes Simplex virus types 1, Human Immunodeficiency virus (HIV), Mumps, Influenza, and Rubella.

There is a lack of information and proper assessment of the infection control activities in oral health care in Palestine(except one study done by Elham Kateeb et. al. which explores factors related to the willingness of Palestinian dentists to treat patients with blood-borne diseases). In addition to this, the lack of information makes it very difficult to monitor and evaluate practices in order to improve infection control system in oral health care.

The results of this study can be used to embank the gap in knowledge, to clarify current practices, and to contribute to developing the infection control system of oral health care in Palestine.

### 1.6 Aim of the Study

To assess the infection control system in dental clinics in Hebron district in Palestine.

## 1.7 Study Objectives

1. To assess the infection control structure(Infection Control System Components), of oral health care in Hebron district in the West Bank.
2. To assess the infection control practices and procedures in oral health care in relation to centers for disease control and prevention (CDC), and for the Palestinian infection prevention and control protocol.
3. To assess differences in compliance for the infection control practice between private and governmental.
4. To evaluate the effects of the socioeconomic(dentists characteristic) factors in the infection control system in oral health care clinics.

## 1.8 Limitation of the study

1. The study did not include the dental technicians and the supporting team " nursing; secretary as well the maintenance technicians.
2. Dentists in the clinical training stage were excluded from this study.
3. UNRWA dental clinics were excluded from the study.
4. Social desirability in answering the self reported survey and behaving in a favorable way when somebody is watching, make it hard to determine if reported or observed behavior reflects the true.

## 1.9 Summary.

This chapter provides an overview about the value of infection control practices that has a direct link to dentistry. The chapter includes the aim of the study, the assessment of the infection control system in oral health care clinics of Hebron district in the West Bank that were achieved through a set of objectives.

# Chapter Two

# Literature Review

## 2.1 Introduction

Infection control is one of the primary responsibilities of Dental Health Care Personnel (DHCP). The mouth's natural flora consists of a vast number of microorganisms. Since dental procedures result in the spread of blood and saliva, infection control is an essential practice in dentistry, there is a growing concern that bacterial and viral (including HBV) aerosols spread through the entire dental room during dental procedures. Infection control practices in developing countries have not been widely documented, ( Altaf H. Shah,et al. 2010 , Abdullah Al-Rabeah et al. 2002, Siegel JD, et al. 2007**).**

Dentists and other health care workers have long been concerned about a variety of infectious agents that may be transmitted within the dental setting. In the recent years, there have also been widespread concern among the general public (Woods R.1984 ) . Many infectious diseases, including HIV, Hepatitis, Tuberculosis and Syphilis, are important because of their potential transmissibility, and because the first manifestations of the disease may appear in the oral cavity (Anders PL, et al. 1998 ). A knowledge of these diseases will allow the practitioner to recognize associated lesions and also to take appropriate steps to minimize the risk of transmission in the dental office (Woods R.1984**,** Anders PL, et al. 1998 **)**

Health care providers are at risk for infection with blood-borne pathogens, including Hepatitis B virus, Human Immunodeficiency virus, and Hepatitis C virus. Recommended infection control practices are applicable to all settings in which dental treatment is provided. Dentists remain at low risk for occupationally acquired Human Immunodeficiency virus. Dental health care workers, through occupational exposure, may have a 10 times greater risk of becoming a chronic Hepatitis B carrier than the average citizen. Although the possibility of transmission of blood-borne infections from dental health care workers to patients is considered to be small, precise risks have not been quantified by carefully designed epidemiologic studies. Emphasis should be placed on consistent adherence to recommended infection control strategies, including the use of

protective barriers and appropriate methods of sterilization or disinfection. Each dental facility should develop a written protocol for instrument reprocessing, operatory cleanup, and management of injuries. Such efforts may lead to the development of safer and more effective medical devices, work practices, and personal protective equipment (Hou J, et. al, 2005, Jinlin Hou, et al. 2005, Alter MJ.2003, UCDPC. 2008 )

Health Care Workers (HCWs) are at the front line for acquiring blood-borne viruses (Hepatitis B virus, (HBV); Hepatitis C virus, (HCV) and Human Immunodeficiency virus, (HIV) infections. The worldwide HBV infection rate is higher in dentists than other blood-borne viruses like HCV and HIV, dentists are at increased risk of being infected by HBV. The main methods of contamination include needle punctures or exposure to blood and other body fluids. To prevent blood transmission of infection, it is recommended that health care professionals receive immunization against the disease and use personal protective equipment (Shepard CW, et al.2006 ).

## 2.2 Infection Transmission Cycle

The chain of infection is a conceptual frame used to understand the infection process. The chain is a circle of elements, each one represents a component in the cycle. In order for the spread of infectious diseases to take place the 'chain of infection' must be complete (Lux , J. (2001).

The first link in the chain is the infectious agent (causative agent). This is the harmful germ or pathogen that can cause infection, illness and disease. These organisms include bacteria, viruses, fungi and parasites. The second link is the reservoir or source. This is where pathogens live and multiply. That could be in or on a person or animal (host), or in soil or water.

The third link is the means of exit. This is how pathogens leave the source. for example, pathogens that live in the respiratory tract (the lungs, throat, etc.) can leave the body through the mouth or nose in saliva or mucus when coughing or sneezing.

The mode of transmission is the fourth link in the chain. It refers to how the pathogen is passed on from one person to another. Contact transmission is the most common route of

transmission of pathogens in a health and social care workplace. This can happen by direct (hands) or indirect contact (equipment), (Sharon K et. al. 2013, Anders PL, et al 1998, Lux , J. (2001) ) .

In dentistry, the nature of many dental procedures can place dental team members and patients in close contact with potential pathogens, especially those found in blood. Diseases can be transmitted from the patient to the dental worker, from the dental worker to the patient, or from one patient to another (Sharon K., et. al. 2013, Anders PL. et al. 1998). In the dental setting, possible modes of transmission include:

1. Direct contact with blood, oral fluids, or other patient materials.
2. Indirect contact with contaminated objects (such as instruments, equipment, environmental surfaces, or team member's contaminated hands).
3. Droplet contact, in which spray or spatter contains microorganisms travel a short distance before settling on the mucous membranes of the eyes, nose, or mouth.
4. Inhalation of evaporated microorganisms ("droplet nuclei") that can remain airborne for extended periods of time as aerosols (Anders PL. et al. 1998).

The fifth link is the portal of entry. This is the way that the pathogen enters the body of the potential host. Pathogens can enter the body by coming into contact with broken skin, being breathed in or eaten, coming into contact with the eyes, nose and mouth or, for example when needles or catheters are inserted.

The sixth and final link in the chain is a person at risk. A person at risk is the individual whom the pathogen moves to. The risk of a person becoming infected depends on factors such as their general health and the strength of their immune system (which is the body's system for fighting germs and micro-organisms), (Lux , J. 2001).

## 2.3 Infection Control and Prevention

Preventing infection means breaking the links in the chain so that an infection cannot spread. Some links are easier to break than others. For example, it is easier to stop a pathogen from entering a person than to stop one leaving an infected person.

The steps taken to protect individuals and workers from infection are an important part of providing high quality care and support. It is important to know that not everybody who carries harmful micro-organisms will be ill or show any symptoms, so we must work in ways that prevent infection at all times,( (CDC .(2011), Sharon K et. al., Nagao Y. Matsuoka H. Kawagushi T. et. al. 2008)

Standard precautions 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 healthcare is delivered. These practices are designed to both protect HCP and prevent HCP from spreading infections to patient standard precautions including: 1) hand hygiene, 2) use of personal protective equipment (e.g., gloves, gowns, masks),3) safe injection practices, 4) safe handling of potentially contaminated equipment or surfaces in the patient environment, and 5) respiratory hygiene cough etiquette. Education and training on the principles and rationale for recommended practices are critical elements of standard precautions because they facilitate appropriate decision making and promote adherence, (Lux , J. 2001).

## 2.4. Globally

Many publications are available on the topic of compliance with infection prevention and control in oral health-care facilities all over the world. The approaches of developing and developed countries show wide variation, but the principles of infection prevention and control are the same globally. Various international studies from developed countries have reported highly scientific evidence-based information. In developed countries, the resources for infection prevention and control are freely available, which is not the case in developing countries. The studies in developing countries also indicates serious

shortcomings with regard to infection prevention and control knowledge and education in oral health-care facilities, (Abdullah Al-Rabeah et al. 2002, Siegel JD, et.al. 2007) .

Cleveland et al. investigated the knowledge about surgical irrigation methods in the USA. They found that dental practitioners were aware that they should use sterile water or saline during surgical procedures; however, only about half of the dental practitioners ever used sterile water or sterile saline during surgical procedures, such as gingivectomy, extraction of an impacted third molar, soft-tissue biopsy or bone recontouring, (Cleveland J, Foster M, Barker L et al. 2012) .

Studies among oral health-care providers and dental students in the USA to explore effectiveness of gloves and infection control in dentistry reported a lack of understanding of the basics of infection prevention and control, (Kanjirath PP, Coplen AE, Chapman JC et al. 2009 )

Some studies indicate that hand washing is suboptimal, a study to provide a comprehensive assessment of hand-hygiene practices of general dentists in the United States. The authors concluded that compliance for hand hygiene among the surveyed participants was 75% and that additional hand-hygiene education is necessary for dental health-care personnel. "While we should always strive for 100% compliance" the researcher said, "the reported compliance rate among general dentists is much better than the 40% compliance reported in the literature for other HCP" (Myers R. et. al. 2008 ) .

In Italy, a survey was conducted on a sample of 200 dentists out of 358 reported in the list of the Dentists of the Province of Bari. To evaluate the disinfection and sterilization practices in dental health services it shows a low level of knowledge of the risk and the use of correct procedures. The majority of the interviewed dentists seemed to consider the infective risk during the exposition to contaminated aerosols or squirts very unlikely. So they underestimate this way of transmission, which is, on the contrary, very effective mainly due to the high environmental resistance of some microorganisms like Hepatitis B virus, (P.L. Lopalco et al. 1998 ) .

In a study investigating the education and knowledge of Turkish dental practitioners, only 43% of participants were able to define ‘cross-infection’ correctly (Yuzbasioglu E, Sarac € ! D, Canbaz SY et al. 2009 ) .

In Brazil, education and knowledge was agreed to contribute in improving infection-control attitudes and behavior. However, upon further investigations of the compliance with infection control, the results in practice were worrying (De Abreu MHNG, Lopes-Terre MC, Braz LF et al. 2009) .

In Sau Paulo, a survey conducted between March 1st and April 30th 2009, (self-administered structured questionnaires) to evaluate the infection control measures actually implemented by dental surgeons during dental practice, as patients and professionals are exposed to a high biological risk in dental care environments, concluded that infection control actions implemented by dental surgeons in their dental practice are far from ideal. The critical observed points were: absence of protective barriers on surfaces, use of non-recommended methods of disinfection, use of ineffective methods of sterilization, lack of monitoring of autoclave sterilization cycles, failure to use indicators, negligent behavior in post occupational accidents, and use of irritant antiseptic solutions (Jacqueline Kimiko Matsuda et al . 2011).

In India, a study indicated that oral health-care professionals have good knowledge of infection control; however, the authors admitted that the compliance levels with infection control were low (Jain M, Sawla L, Mathur A et al. 2010 ).

A study in India, investigated the current biomedical waste management practices and cross-infection control procedures of dentists, concluded that infection-control guideline training among oral health-care personnel and cooperation with local hazardous waste-disposal authorities were identified as priorities (Singh BP, Khan SA, Agrawal N et al. 2012).

In Bangladesh, a cross-sectional study was conducted to assess the standard and level of infection control practice in the dental clinics in Dhaka city, it showed that the dental practitioners had a low level of infection control knowledge and compliance and it recommended to provide formal intensive training courses on infection control for the

dental professionals of all categories before issuing license to the dental clinics special attention need to be given on the infection control status of the clinic, policies and programs should be developed and implemented for dental-health workers in respect of training, education and self-immunization (Ahmed et. al. 2014)

### 2.5. Regionally

In Jordan, a cross-sectional study design was performed among dentist to assess the compliance of General Dental Practitioners (GDPs) in the private sector in North Jordan with infection control measures, it showed that, about 13.6% of dentists were found to be fully compliant with the complete list of infection control procedures, with more young females being compliant than males (Mohammad Ahmad Al-Omari et al. 2005).

In Iran, a cross-sectional analytical study was completed in 2009. It included 63 Iranian dental practitioners to evaluate whether the infection control practices of Iranian dentists and dental nurses working in governmental dental health care centers were influenced by their educational level and years of practice or not. Infection control knowledge was evaluated with a self-administered questionnaire, and infection control practices were evaluated with a checklist of questions by one researcher's observation. It showed that the dental practitioners in Mashhad had a low level of infection control knowledge. Dental personnel with a higher educational level had significantly greater knowledge than those with less education. Additionally, dental personnel who had more years of practice had a greater knowledge of infection control (Ebrahimi M et al. 2012).

In Iran, a cross-sectional study was conducted in Shiraz to evaluate the knowledge, attitude and practice of dentists towards post-exposure prophylaxis(PEP), the study found out undesirable results on dentists' knowledge, attitude and practice towards (PEP), which showed that the participating dentists did not manage their occupational exposures adequately, according to the CDC guidelines, the study found an inadequate level of knowledge about (PEP) and showed that the dentists' attitude towards (PEP) is not pertinent. Of the studied dentists, 43% believed that immediate washing of the contaminated area was ineffective in prevention of Hepatitis and AIDS, and 13% considered (PEP) to be ineffective in reducing the risk of acquiring AIDS (S. Shaghaghian et al. 2014).

A descriptive cross-sectional study, including all general and specialized dental offices in Hamadan, Iran, was conducted in 2010to evaluate the infection control in dental offices in Hamadan. The study showed that the overall status of infection control in dental offices is deemed inadequately, and it revealed significant differences between the general and specialized offices in relation to all of the aspects except the personal protection measures, and demonstrated that specialized offices were more successful in implementing infection control measures (Jamshidi et al. 2010).

In Saudi Arabia, a cross-sectional survey of private dental practices in the capital city, Riyadh, showed that the dental practitioners had an inappropriate level of infection control knowledge. The study recommended to development of infection control manual for dental practices, in addition to a campaign of health education for dentists in the private sector(Abdullah Al-Rabeah et al. 2002).

In a study to assess the infection control in public dental clinics in Khartoum State, Sudan, a lack of compliance towards infection control was a general feature of the findings of this research (Modather Sheikh Idris September 2012).

### 2.6 Nationally

This study is considered to be the first work in the oral health care units in Palestine, and no other studies were made with similar objectives in the West-Bank.

Elham Kateeb et al. investigated factors related to the willingness of Palestinian dentists to treat patients with blood-borne diseases. They found that more dentists declined to treat simulated HIV-infected patients than simulated HBV-infected patients (68% and 32%, respectively),another result was the significant differences in the odds of accepting those patients in the governorates of the center and the south comparing with the governorates of the north. The researcher explained this result, might be related to the cultural differences among those areas and the degree of urbanization, where northern governorates are the most conservative and the least urbanized among other governorates.

In a study to investigate the dental waste management practices and safety measures implemented by dentists in Nablus district, Palestine, a comprehensive survey was conducted for 97 out of 134 dental clinics to assess the current situation. The focus was placed on hazardous waste produced by clinics and the handling, storage, treatment and disposal measures taken. Mercury, found in dental amalgam, is one of the most problematic hazardous waste. The findings revealed that there is no proper separation of dental waste by classification as demanded by the World Health Organization (Mosleh S. Al Subu M. AlKhatib 2004).

# Chapter Three
# Methodology

## 3.1 Introduction

This chapter contains study design, study setting, study population, sampling method, sampling size, data collecting tools (instruments), pilot study, data analysis, ethical considerations, and conceptual framework.

## 3.2 Study Setting, Sampling Method and Sampling Size

Oral health care services in Palestine are provided through a mix of sectors including the public (MOH), private and nongovernmental organization (NGOs).A Simple Random Sample (SRS) size 109 dentists from all private dental clinic registered in the Palestinian Dental Association till the year of 2014 (418 members), and all of the governmental dental clinic in Hebron area were covered in this study.

## 3.3 Study Population

The study population are dentists who have direct contact with the patient and provide oral health care for the client. The total sample included 109 dentists have their private clinic and all public clinics which is run by the Palestinian Ministry of Health (there are only7 governmental clinic in Hebron area, and they were all selected to represent the public sector).

## 3.4 Study Design

A quantitative, descriptive, and a cross sectional design in order to assess the infection control program at the oral health care units in Hebron area. Data was collected between February and August of 2016. 116 questionnaire forms were distributed to 116 dentists working in public and private clinic.

### 3.5 Instruments

Two instruments, a questionnaire (self-administered questionnaire) and a check list were be used to collect the data. A self-administered questionnaire developed by CDC and the Palestinian infection and training protocols that were updated in 2010 by the Palestinian Ministry of Health to assess the dentists' knowledge, attitudes, and perception. The questionnaire was prepared in English because it is related and extracted from protocols that were written originally in English.

The second tools is a checklist of questions by observation (conducted with one researcher, and the researcher (Dentist) spent 20 years working in various private dental clinic settings)used in this study to ensure the dental health care setting to have the appropriate infection prevention policies and practices in place,(which is adapted to measure real behavior of dental health care working of implementation the infection control program in dental clinic in Hebron area), including appropriate training and education of Dental Health Care Personnel (DHCP) on infection prevention practices, and adequate supplies to allow (DHCP) to provide safe care and a safe working environment. Both tools were validated by five qualified people who are experts and specialists in infection control.

The Reliability scale(Cronbach’s alpha) for each part from the three parts of the research tool was computed. The scale was 0.86 for the Infection Control Structure Assessment Domains, 0.79 for the Infection Control Checklist for dental setting part, and 0.76 for barriers part that influence the implementation/ adherence to the infection control practices in the Oral Health Care Clinic. These values of reliability scales indicate that there exists acceptable reliability for the three parts of the research tools, and from 93% to 97% of the whole data can be reproduced in the case of repeating this research using the same tool.

### 3.6 Pilot Study

A pilot study was carried out to test the suitability of the method of collecting the data. Check that all the parameter measurements are clear and unambiguous. The pilot study was

carried out in Bethlehem district. After permission was obtained, ten participants were interviewed. Participation was voluntary and the informed consent was signed after information regarding the research aims and objectives were provided to the participants. Following the pilot study, the questionnaire was found to be clear and easy to understand, ensured minimum participants 'errors, efficient interpretation of the data and evaluated knowledge, attitude and behavior of the participants

### 3.7 Data Analysis:

After completing data collection, the process of entering the data started by using the Statistical Package for Social Science(SPSS 20). The answers of respondents were converted to 5-Likert scale by recoding answers to numeric values. Five degrees were given for Strongly Agree answers, four degrees were given for Agree answers, three degrees were given for Neutral, two degrees were given for Disagree answers, and 1 degree was given for Strongly Disagree answers.

Descriptive statistics including frequencies, percentages, means(averages) and standard deviations were produced for all domains to measure perceptions of respondents. The percentages of positive responses (Agree and Strongly agree)were calculated in order to identify areas of strength or areas of potential improvement.

The independent samples T-test and the one way analysis of variance(One Way ANOVA)were used for the purpose of determining the relationship between composite infection control compliance scores and different respondent and clinic characteristics. A P-value$\leq$0.05 was considered statistically significant in the analysis of the data. Alpha (Cronbach's) scales were calculated to measure the reliability of the research tool,(Cronbach's alpha is a measure used to assess the reliability, or internal consistency, of a set of scale or test items).

A scale was used to describe the findings of data regarding the strength of the issue as high was considered $\geq$80%, the moderate was between 60%-79%, and low was <60%.

### 3.8 Ethical Considerations

Permission to carry out the present study was obtained from the Oral Health Directorate, Ministry of Health of the State of Palestine. Participation in this study was entirely voluntary and informed consent was signed after information regarding the research aim and objectives which were provided to the participants who were allowed to withdraw from the study at any time should they wish to do so without any punishment. It was emphasized that strict confidentiality were maintained at all times and that none of their names or personal details were mentioned in the write up of the study.
Anonymity was achieved by not using the participant's names on the questionnaire
and the questionnaire was recorded with serial numbers.

### 3.9 Conceptual Framework

#### 3.9.1 Introduction

Infection control practice services as very important segment of modern health care. While there is minimal research on health practitioners perception of infection control and how those perception influence health providers compliance with recommended measure.
The research framework was used to explore health care professionals' attitudes and perceptions of infection control practices. According to a literature review and reviewing all models suggested for infection control practices in oral health care, the theoretical worldwide summary, WHO, the American institute for communicable disease and others. Two main domains from infection control protocol were adopted and investigated: Personal Protective Equipment, and Infection Control Measures (ICM). In the analysis of the results we use different tests (T-test, Chi square test, Post hoc test, percentages average), where everyone is appropriate.

#### 3.9.2 Overall Compliance to Infection Control Standard

The compliance stands for the final output from the use of infection control measures that can be affected by the dental clinic or respondents (Dentists) characteristics. Its measurements provide correct and realistic indications that reflect the importance of increasing infection control compliance to maintain the safety of clients' health. The

compliance to infection control differed from clinic to another and appeared differently depending on many factors such as the lack of knowledge, attitude, supplies and materials and the lack of some necessary equipment (Yassi, A., et. al., (2007).

### 3.9.3 Variables Measurement

To measure different variables of the study we use two instruments. The first is a questionnaire (self-administered questionnaire) to assess the dentists' knowledge, attitudes, and perception, using the five-point Likert scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree), which is used to allow the individuals to express how much they agree or disagree with a particular adapted statement for every domain of the questionnaire, which illustrated in annex number 1.The sources of the annex (1) statements were from CDC and the Palestinian infection and training protocols that were updated in 2010 by the Palestinian Ministry of Health, which is adapted for all health care setting in Palestine (there is no specific infection control program in dental care setting in Palestine).

The second tool is a checklist with observation to measure accurate behavior of dental health care workers of implementation the infection control program in dental clinic in Hebron area, a set of questions with probability of yes or no answer dependent on the accurate behavior of the respondents, whether he behave as it is recommended (yes) or not as it is recommended (no), with particular adapted questions for every domain of the checklist, which illustrated in annex number 2.The above mentioned checklist is adapted from infection control inspection checklist related to Kentucky Board of Dentistry, CDC (Guidelines for Infection Control in Dental Health-Care Settings—2003), and Infection prevention and control manual for dental setting in Kingdom of Saudi Arabia, Ministry of Health ,( first edition 2013).

### 3.9.4 Dependent Variables:

All of the following dependent variables were measured by a five-point agreement scale on statements adapted from CDC and Palestinian infection and training protocols that were updated in 2010 by the Palestinian Ministry of Health, which is adapted for all health care setting in Palestine and found in appendix (1) which measured the dentists' knowledge, attitudes, and perception. Checklist with observation to measure the accurate behavior of dental health care workers, a set of questions with a probability of yes or no answer

dependent on the accurate behavior of the respondents is adapted by the infection control inspection checklist related to Kentucky Board of Dentistry, CDC (Guidelines for Infection Control in Dental Health-Care Settings—2003), and infection prevention and control manual for dental setting in Kingdom of Saudi Arabia, Ministry of Health ,( first edition 2013), which found in appendix 2.

The following concepts were measured:

#### 3.9.4.1 Hepatitis Vaccination:

Hepatitis B Virus (HBV) is highly infectious and causes serious health problems worldwide. Approximately, one third of the world population has been infected, and 400 million have become chronic-disease carriers. HCWs are at high risk for HBV infection because of the particular exposure of mucus membranes and breached skin, (Ling ML, et al.,2000, Shiao J, et al.2002 Ciorlia LA, et al.2005, U.S. Public, Health Service,2001) . HBV-infected, HCWs also pose a potential risk for patients as there is documented risk of HBV transmission to patients from treating doctors or medical staff (Roggendorf M, Viazov S. 2003). According to WHO, 5.9% of HCWs are exposed each year to blood-borne HBV infections corresponding to about 66,000 HBV infections in HCWs worldwide (ADA, 1996)..According to communicable disease center, all of the OHCP should be immunized before they are placed in risk situations where they may become susceptible to transmission of infections (CDC, 2003a). Hepatitis B vaccine consists of three doses of intramuscular injections. The second and third doses should be introduced one and six months after the first dose respectively (Molinari JA, Terezhalmy GT. 2010). The vaccine is effective in individuals who produce >100mIU/mI level of antibodies to hepatitis B surface antigen (anti-HBs). The antibody level (anti-HBs) should be measured 2 to 4 months after completion of the course of vaccination. A single booster dose five years after completion of vaccine course is recommended for OHCW who have contact with blood or OPIM. Vaccination of all dentists and staff members who come in contact with patient is a policy of the American Dental Association. Dependent of the above mentioned information, the Health Care Workers (HCWs), who have a reasonable expectation of being exposed to blood on the job, should be offered hepatitis B vaccine to prevent blood transmission of infection, and use personal protective equipment (Shepard CW. Simard EP. Finelli L. et. al. Jan. 2006).

### 3.9.4.2 Personal Protective Equipment Compliance:

It was as measured by its different component and by a composite variable that summed all the components in one value using averaging percentages, and Chi square test analysis.

**1. Gloves:** Oral Health Care Workers**(**OHCW) may come in contact with mucous membranes, blood or Other Potentially Infectious Materials (OPIM) during patient care; therefore, gloves are used to protect their hands as well as to prevent microorganisms present in their hands from being transmitted to their patients(CDC .(1993), CDC .1986). Based on their use, there are two types of medical gloves: no sterile examination gloves, and sterile surgeon‘s gloves. The former are used, as their name indicates, for examination and other non-surgical procedures. Sterile surgeon‘s gloves, on the other hand, are used when performing invasive surgical procedures, for example, incision, excision, flap reflection (Molinari JA, Harte JA, 2010). Dental practitioners and clinical support staff must wear gloves whenever there is a risk of exposure to blood, saliva or other body secretions or when hands will come in contact with mucous membranes, gloves must discarded between patients and after each task (Sharon K et. al. 2013).

**2. Mask:** OHCW should wear masks to protect their mouth and nose from blood or other body fluids that may spatter during dental treatment (Sharon K et. al. 2013, BDA February 2003P, CDC, 2003a). Masks are also used to protect the patients from microorganisms generated by the mask wearers (CDC, 2003a)

**3. Eye Protection**: Protective eye wear is used to prevent both physical injury and microbial contamination with possible consequent infection to the eyes (Molinari JA, Harte JA, 2010). It must be worn to protect the eyes of OHCW from sprays or splashes of blood or saliva or debris that may be generated during a dental treatment (Sharon K et. al. 2013, BDA February 2003P, CDC, 2003a).

**4. Protective Clothing and Footwear**: Protective clothing should be worn while treating patients when aerosols or splatter are likely to be generated, or when contamination with blood or saliva is possible. Dental practitioners and clinical support staff should wear enclosed footwear that will protect them from injury (Nagao Y. Matsuoka H. Kawagushi T. et. al. 2008, Sharon K et. al. 2013)

### 3.9.4.3 Washing Hands

The CDC recommends that hand hygiene should be performed when hands are visibly soiled, after touching an object which is likely to be contaminated with blood or OPIM, before and after treating each patient, before and after gloving or if the integrity of the glove is compromised(CDC., 2002).

Hand washing are considered as the most effective tools of preventing the transfer of microorganisms from health care providers to patients and vice versa. Microorganisms that cause health care acquired infection are most likely to be transmitted from the hands of health care workers (CDC. ,2002).

Partt et, al (2007) confirmed that the cross transmission of microorganisms in health care centers, either directly from hands or indirectly from environmental source via hands, is a major contributing factor in the current infection threats to patient (Pratt RJ et al. ,2007)

This study part measures whether washing hands is a major routine procedure followed on a daily basis at the DHCP level.

### 3.9.4.4 Instruments Sterilization:

It was measured by its different component and by a composite variable that summed all of the components in one value using averaging percentages**,** and Chi square test analysis.

Contaminated items should be handled with care to minimize an unnecessary percutaneous injury (U S Department of Labor, Occupational Safety and Health Administration (OSHA) 1991). Used items must be cleaned completely prior to sterilization(CDC., 2003a)

Steam sterilization or autoclaving is the method of choice for sterilizing dental instruments (BDA, 2003P). It is the most widely used, reliable, and economical method (Miller CH, Palenik CJ, 2001). A temperature of 134 – 137 °C must be reached and continued for three minutes and is appropriate for sterilization of dental instrument((BDA, 2003P). This is the most widely used, reliable, and economical method (Miller CH, Palenik CJ, 2001). and is the method of choice as recommended by the BDA(BDA, 2003P)..Another type of sterilization is dry heat sterilization which requires relatively longer operating time compared with autoclaves and require higher temperature which is not suitable for some dental instrument ( Joslyn LJ, 2001). It can be a useful method for sterilizing

instruments that corrode by moist heat (Miller CH, Palenik CJ, 2001). .Finally unsaturated chemical vapor method of sterilization requires heating of a chemical solution in a closed pressurized chamber. Because of low level of water used during this process, it causes less corrosion, and therefore it is suitable for sterilizing carbon steel instruments e.g. burs (CDC, 2003a).Surface disinfection and or immersion in chemical germicides are both unacceptable methods( CDC, 2003a, Molinari JA, Terezhalmy GT. (2010).

**Sterilization of Handpieces**

Most of respondents agree that they did not sterilize handpieces following each patient treatment, and they were satisfied cleaning it with alcohol,(Sterilization of handpieces is strongly recommended and autoclaving is the preferred method. Surface disinfection and/or immersion in chemical germicides are both unacceptable methods (CDC (2003a), Molinari JA, Terezhalmy GT. (2010).

**Monitoring of Sterilization**

Monitoring of Sterilization refers to the use of mechanical, chemical and biological indicators to evaluate the sterilizing condition and the effectiveness of the procedure (CDC (2003a), Harte, JA and Molinari, JA. ,2010).

**Mechanical Indicators:** Mechanical indicators are used to evaluate time, temperature, and pressure of each sterilization cycle by observing criterion and offer of sterilizer. Correct readings do not ensure perfect sterilization, while incorrect readings indicate the possibility of a problem(CDC ,1993).

**Chemical Indicators:** These are sensitive chemicals used to evaluate the physical situations of sterilization (e.g. time and temperature) during each cycle. The color of the indicator is changed when proven parameters are reached. Chemical indicators do not ensure sterilization but they are used to recognize any errors that may occur during the sterilization process, they are of two types of the indicators: external and internal. External chemical indictors are located outside the instrument packaging and are used to show that the packaging has been processed through sterilization cycle(AAMI, 1999). Internal chemical indicators, on the opposite, are used to confirm that the sterilization agent has penetrated the wrapping material and reached the instrument (CDC, 2003a)

**Biological Indicators :** This is the most reliable method for sterilization monitoring (ADA , 1996). as it directly assesses the killing of known highly resistant microorganisms rather than merely evaluating chemical and physical conditions required for sterilization (CDC ,1993). It is necessary to verify that the sterilizer is functioning correctly by the use of Biological Indicator (BI) at least once a week (CDC, 1993), Dougherty, L. and Lister, S. ,2011)

**Disinfection**: Disinfection is the process of destroying pathogenic and other microorganisms on inanimate objects by physical or chemical means. Disinfection does not ensure the higher safety margin of sterilization, and therefore the golden role is to not disinfect if sterilization is possible (Molinari JA, Harte JA , 2010).

3.9.4.5 **Decontamination and Cleaning**

Surfaces that do not come in direct contact with patients are known as environmental surfaces. They are of two types: clinical contact surfaces (e.g. light handles, switches, radiograph equipment, pens etc.), and housekeeping surfaces (e.g. walls and floors). Some of these surfaces can act as a reservoir for bacterial contamination and can be indirectly associated with transmission of infections mainly through hand contact, which indicates that hand hygiene has an important role to play in reducing the transmission of infection through this route. Other methods are cleaning and disinfection of environmental surfaces and the use of barrier protection (Molinari JA, Harte JA, 2010).The use of barrier protection is preferred, especially for those surfaces which are difficult to clean (Miller CH, Palenik CJ, 2001).

### 3.9.5 Independent Variables

**Independent Variable**: whose factor is measured by the researcher to determine its relationship with an observed phenomenon. In a research study, independent variables are previous conditions that are presumed to affect a dependent variable.

Many studies displayed the effects of independent variables such as sex, level of education, years of experience, general or specialist, ownership, and training received on the compliance to infection precaution which is illustrated in this study and the attitude to the infection protocol by ownership and gender.

In this study, the following independent variables were used, and therefore consider the importance (using Chi square test, T-test and post hoc test in the analysis).

**Gender**: This refers to male and female respondents.

**Age**: This refers to the age of the respondents, which composed of three categories,(Less than 30 years, 30-39, 40-49, 50 years or more ) .

**Years of experience**: This refers to the years of work spent in the oral health care, which composed of four categories (1-3 years, 3-5 years, 6-10 years, > 10 years**)**.

**Ownership**: This refers to the ownership of the oral health care setting, public or private.

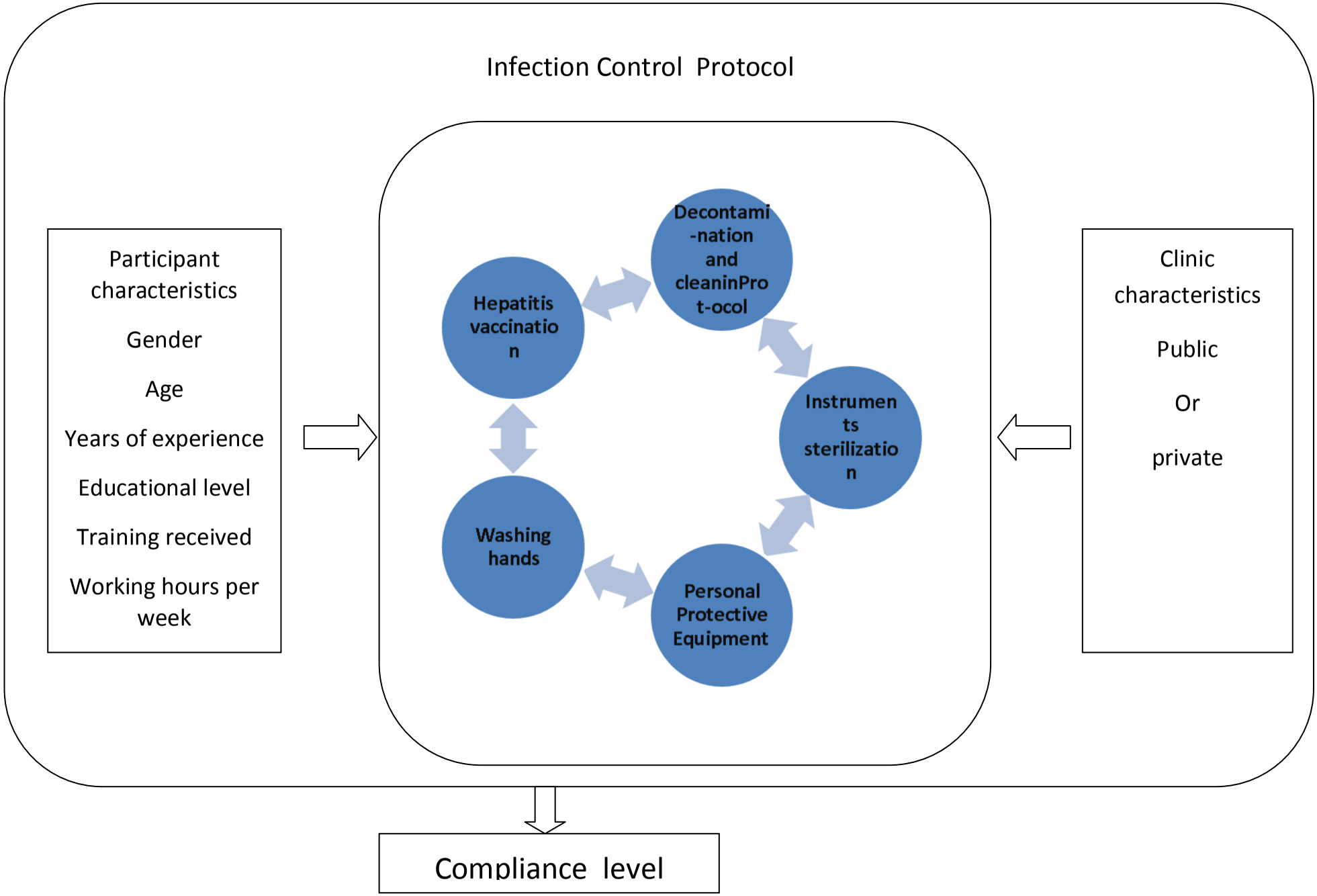
**Educational Level**: This refers to the level of education obtained by respondents, general or specialist.

**Training Received**: This refers to the training received on the infection precaution,(which is measured by Yes if the respondent received infection control training courses and No if he did not receive infection control training courses.

**Infection Control Program :** This refers to the factors that might affect infection control program which is measured by Yes or No questions, which illustrated in appendix 2 .

**Working Hours Per Week**: This refers to the sum of working hours per week for every member of dental staff, which composed of three categories (< hours per week,35 hours per week, >35 hours per week).

**Figure 3.1:Conceptual framework model of the study**



# Chapter Four

# Results

## 4.1 Introduction

This chapter presents the findings and results of the study assessment of the infection control system in oral health care clinics in Hebron district.

The section includes two parts. Part one presents the participants and clinics characteristics. Part two presents the attitude and compliance to infection control domains which are personal protective equipment compliance (Gloves, Masks, Eye protection), washing hands compliance, sterilization, decontamination and cleaning, and Hepatitis vaccination.

## 4.2 Participants Characteristics

By characteristics of the respondents table below, it is noticed that concerning the gender variable, the percentage of the category (Male) is (71.6%), and the percentage of the category (Female) is (28.4%) from the total number of the sample size. Concerning the age variable, the percentage of the category (Less than 30 years) is (14.7%), the percentage of the category (30-39) is (53.2%), the percentage of the category (40-49) is (23.9%), and the percentage of the category (50 years or more) is (8.3%) from the total number of the sample size. Concerning the years of experience variable, the percentage of the category (1-3 years) is (9.2%), the percentage of the category (4-5 years) is (14.7%), the percentage of the category (6-10 years) is (35.8%), and the percentage of the category (>10 years) is (40.4%) from the total number of the sample size. Concerning the educational level variable, the percentage of the category (Specialist) is (16.5%), and the percentage of the category (General) is (83.5%) from the total number of the sample size. Concerning the ownership variable, the percentage of the category (Public) is (6.4%), and the percentage of the category (Private) is (93.6%) from the Total number of the sample size. Concerning the working hours per week variable, the percentage of the category (<35 hours per week) is (5.5%) from, the percentage of the category (35 hours per week) is (26.6%), and the percentage of the category (>35 hours per week) is (67.9%) from the total number of the sample size.

**Table 4.1 : Characteristic of the Respondents.**

| **Gender** | N | % |
|---|---|---|
| Male | 78 | 71.6 |
| Female | 31 | 28.4 |
| Total | 109 | 100.0 |
| **Age** | N | % |
| Less than 30 years | 16 | 14.7 |
| 30-39 | 58 | 53.2 |
| 40-49 | 26 | 23.9 |
| 50 years or more | 9 | 8.3 |
| Total | 109 | 100.0 |
| **Years of Experience** | N | % |
| 1-3 years | 10 | 9.2 |
| 4-5 years | 16 | 14.7 |
| 6-10 years | 39 | 35.8 |
| >10 years | 44 | 40.4 |
| Total | 109 | 100.0 |
| **Educational Level** | N | % |
| Specialist | 18 | 16.5 |
| General | 91 | 83.5 |
| Total | 109 | 100.0 |
| **Ownership** | N | % |
| Public | 7 | 6.4 |
| Private | 102 | 93.6 |
| Total | 109 | 100.0 |
| **Working Hours Per Week** | N | % |
| <35 hours per week | 6 | 5.5 |
| 35 hours per week | 29 | 26.6 |
| >35 hours per week | 74 | 67.9 |
| Total | 109 | 100.0 |

The results of the table below showed that only 5.5% of the respondents were received infection control training courses in the last two years, only19.3% of the respondents have access to infection control protocol when they need it,89.9% of the respondents need to learn more about infection control training protocol, and 19.3% of the respondents think that system enforce implementation of infection control protocol at the clinic.

**Table 4.2 : Infection Control Program.**

| **Received Any Infection Control Training Courses in the Last Two Years** | N | % |
|---|---|---|
| Yes | 6 | 5.5 |
| No | 103 | 94.5 |
| Total | 109 | 100.0 |
| **Access to Infection Control Protocol** | N | % |
| Yes | 21 | 19.3 |
| No | 88 | 80.7 |
| Total | 109 | 100.0 |
| **Need to Learn More about Infection Control Training Protocol** | N | % |
| Yes | 98 | 89.9 |
| No | 11 | 10.1 |
| Total | 109 | 100.0 |
| **System Enforce Implementation of Infection Control Protocol at the Clinic** | N | % |
| Yes | 21 | 19.3 |
| No | 88 | 80.7 |
| Total | 109 | 100.0 |

### 4.3 Attitude to Infection Control Protocol

This part shows the responses of the participants' attitude to the different domains extracted from the Palestinian infection control protocol for all health care setting and the international standards of CDC.

**Infection Control Structure Assessment Domains:**

**Table 4.3 :Hand Washing Domain.**

| Hand Washing | Mean | Mean / 100 | S.D | Positive response % |
|---|---|---|---|---|
| Wash hands before and after touching the patient. | 4.85 | 97.00% | 0.57 | 96.3% |
| Wash hands before performing invasive Procedure. | 4.72 | 94.40% | 0.85 | 92.7% |
| Wash hands when visibly soiled, or after touching mucus membranes, blood and body fluids. | 4.85 | 97.00% | 0.64 | 96.3% |
| Replace hand wash with alcohol hand rub when hands are visibly clean. | 2.64 | 52.80% | 1.48 | 27.5% |
| **Total Hand Washing** | 4.27 | 85.40% | 0.60 | 78.2% |
| **Cronbach's Alpha** | 0.73 | | | |

The results in the table above show that there is a relatively high positive response regarding Hand Washing(78.2%). The respondents have high positive responses regarding: washing hands before and after touching the patient(96.3%), washing hands before performing invasive procedure (92.7%), washing hands when visibly soiled, or after touching mucus membranes, blood and body fluids(96.3%).From the other hand, the respondents have low positive responses regarding: replacing hand wash with alcohol hand rub when hands are visibly clean(27.5%).This reveals a high attitude rate of the participants to the protocols with regard to hand washing practices.

**Table 4.4 :Hand Gloving Domain.**

| Hand Gloving | Mean | Mean / 100 | S.D | Positive response % |
|---|---|---|---|---|
| Wear gloves prior to contact with blood and body fluids from all patients. | 4.82 | 96.40% | 0.70 | 96.3% |
| Wear sterile gloves for invasive procedures | 3.12 | 62.40% | 1.41 | 42.2% |
| Gloves are discarded between patients | 4.82 | 96.40% | 0.70 | 96.3% |
| Gloves are discarded after each task | 3.32 | 66.40% | 1.48 | 45.0% |
| **Total Hand Gloving** | 3.75 | 75.00% | 0.84 | 69.95% |
| **Cronbach's Alpha** | 0.71 | | | |

The results in the table above show that there is a moderate positive response regarding hand gloving(69.95%). The respondents have high positive responses regarding: wearing gloves prior to contact with blood and body fluids from all of the patients(96.3%). On the other hand, the respondents have relatively low positive responses regarding: wearing sterile gloves for invasive procedures (42.2%), and gloves are discarded after each task (45%). About wearing sterile gloves, respondents said that sterile gloves are not easily available in the market, and for the question of "if gloves are discarded after each task", the same patient thinks that it is not necessary.

**Table 4.5 :Masks, Eye Protection, and Hepatitis Vaccination Domain.**

| Masks | Mean | Mean / 100 | S.D | Positive response % |
|---|---|---|---|---|
| Masks always used when working with patients. | 3.88 | 77.60% | 1.11 | 67.9% |
| **Eye protection** | | | | |
| Eye protection is always used when working with a patient for both patient and client. | 2.16 | 43.20% | 1.04 | 12.8% |

| | | | | |
|---|---|---|---|---|
| **Hepatitis vaccination** | | | | |
| All workers who involved with patient treatment must receive Hepatitis B vaccinations. | 4.92 | 98.40% | 0.49 | 98.2% |
| **Cronbach's Alpha** | 0.708 | | | |

The results in the table above show that the respondents have moderate positive responses regarding using masks continuously when working with patients (67.9%). The respondents have very low positive responses regarding using eye protection continuously when working with patients for both patient and client(12.8%).The overall score for compliance with personal protective equipment is50.21% (means to the three components, hand gloving 69.95%, masks 67.9%, eye protection 12.8%). The respondents have high positive responses regarding the statement(All workers involved with a patient's treatment must receive Hepatitis B vaccinations) with(98.2%).

**Table 4.6 :Decontamination and Cleaning Domain.**

| Decontamination and Cleaning | Mean | Mean / 100 | S.D | Positive response % |
|---|---|---|---|---|
| Surfaces that come with direct contact to body fluids as counters, chairs etc, are cleaned using a medical approved disinfects. | 4.14 | 82.80% | 1.13 | 76.1% |
| Sinks and toilets are cleaned daily or more often as needed. | 4.18 | 83.60% | 0.96 | 82.6% |
| Instruments are cleaned with soup and water prior to sterilization. | 4.26 | 85.20% | 1.02 | 82.6% |
| **Total Decontamination and Cleaning** | 4.19 | 83.80% | 0.78 | 80.4% |
| **Cronbach's Alpha** | 0.79 | | | |

The results in the table above show that there is a high positive response regarding decontamination and cleaning (80.4%). According to the respondents' positive responses, sinks and toilets are highly cleaned daily or more often as needed (82.6%), instruments are

highly cleaned with soap and water prior to sterilization(82.6%), and surfaces that come with direct contact to body fluids as counters, chairs etc., are moderately cleaned using a medical approved disinfects(76.1%).

**Table 4.7 :Instruments Sterilization Domain.**

| **Instruments sterilization** | **Mean** | **Mean / 100** | **S.D** | **Positive response %** |
|---|---|---|---|---|
| Handpieces sterilized following each patient treatment. | 1.99 | 39.80% | 1.34 | 18.3% |
| Individual burrs either discarded or sterilized following each use. | 3.98 | 79.60% | 1.23 | 72.5% |
| All instruments involved in clinical patient care sterilized following each patient's treatment. | 3.89 | 77.80% | 1.03 | 54.1% |
| Routine verification that the sterilization method is functioning properly is necessary. | 3.42 | 68.40% | 1.21 | 45.0% |
| Clean, disinfect, and sterilize items in a **separate** area maintained for this purpose. | 2.62 | 52.40% | 1.18 | 23.9% |
| **Total Instruments sterilization** | 3.18 | 63.60% | 0.89 | 42.8% |
| **Cronbach's Alpha** | 0.78 | | | |

The results in the table above show that there is a relatively low positive response regarding instruments sterilization(42.8%). The respondents have low positive responses regarding: sterilizing handpieces following each patient treatment(18.3%), and cleaning disinfect, and sterilizing items in a separate area maintained for this purpose(23.9%). The respondents have relatively low positive responses regarding: sterilizing all of the

instruments involved in clinical patient care following each patient's treatment(54.1%), and the necessity of routine verification that the sterilization method is functioning properly(45%).The respondents have moderate positive responses regarding discarding or sterilizing individual burrs following each use(72.5%).

**Table 4.8 :Approved Methods of Sterilization.**

| **Instruments sterilization** | **F** | **%** | **Mean** | **Mean / 100** | **S.D** | **Positive response %** |
|---|---|---|---|---|---|---|
| Approved method of sterilization use : | | | | | | |
| Non | 1 | 0.9% | ---- | ---- | ---- | ---- |
| Autoclave. | 103 | 94.5% | 4.95 | 99.00% | 0.41 | 99.1% |
| Dry Heat. | 2 | 1.8% | 4.50 | 90.00% | 0.71 | 100% |
| Heat/Chemical Vapor. | 0 | 0% | 0 | 0.00% | 0 | 0% |
| All | 2 | 1.8% | 3.17 | 63.40% | 1.18 | 50% |
| Autoclave & Heat/Chemical Vapor | 1 | 0.9% | 5 | 100.00 % | ---- | 100% |

The results in the table above show that the most approved method of sterilization use is the Autoclave(94.5%), percentage of usage with (99.1%) positive responses. The other methods of sterilization are used very low.

**Table 4.9 : Attitude to Infection Control by Clinic Ownership.**

| **Domain** | **Ownership** | **N** | **Mean** | **S.D** | **T** | **P-Value** |
|---|---|---|---|---|---|---|
| **Total Hand Washing** | Public | 7 | 3.96 | 0.64 | -1.37 | 0.17 |
| | Private | 102 | 4.29 | 0.60 | | |
| **Total Hand Gloving** | Public | 7 | 3.71 | 0.65 | -0.12 | 0.90 |
| | Private | 102 | 3.75 | 0.85 | | |
| **Masks** | Public | 7 | 3.86 | 1.21 | -0.06 | 0.95 |
| | Private | 102 | 3.88 | 1.11 | | |
| **Eye Protection** | Public | 7 | 2.29 | 1.25 | 0.34 | 0.73 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Private | 102 | 2.15 | 1.03 | | |
| **Hepatitis Vaccination** | Public | 7 | 5.00 | 0.00 | 0.46 | 0.65 |
| | Private | 102 | 4.91 | 0.51 | | |
| **Total Decontamination and Cleaning** | Public | 7 | 3.48 | 0.90 | -2.58 | 0.01 |
| | Private | 102 | 4.24 | 0.75 | | |
| **Total Instruments Sterilization** | Public | 7 | 3.60 | 0.70 | 1.30 | 0.20 |
| | Private | 102 | 3.15 | 0.89 | | |

The results in the table above show that there are significant differences between public and private clinics only in decontamination and cleaning(P-value<0.05), the private clinics(Mean=4.24) have decontamination and cleaning more than public clinics(Mean=3.48).

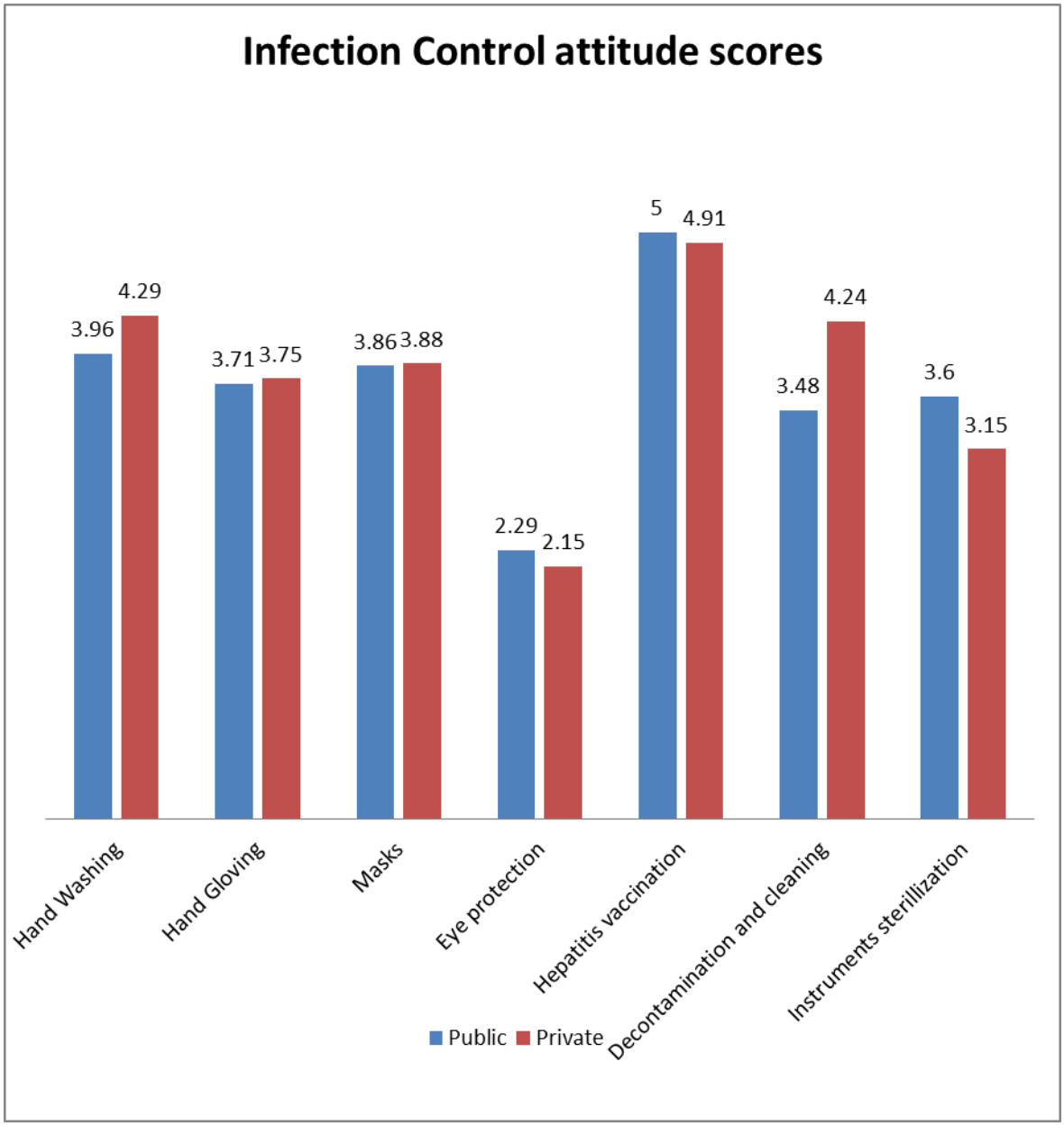



**Figure 4.1 Infection Control Attitude Scores**

**Table 4.10 :Attitude to Infection Control by Gender of Respondent.**

| Domain | Gender | N | Mean | S.D | T | P-Value |
|---|---|---|---|---|---|---|
| **Total Hand Washing** | Male | 78 | 4.16 | 0.61 | -3.01 | 0.00 |
| | Female | 31 | 4.53 | 0.49 | | |
| **Total Hand Gloving** | Male | 78 | 3.67 | 0.84 | -1.62 | 0.11 |
| | Female | 31 | 3.96 | 0.82 | | |
| **Masks** | Male | 78 | 3.99 | 1.04 | 1.60 | 0.11 |
| | Female | 31 | 3.61 | 1.26 | | |
| **Eye Protection** | Male | 78 | 2.19 | 1.05 | 0.58 | 0.56 |
| | Female | 31 | 2.06 | 1.03 | | |
| **Hepatitis Vaccination** | Male | 78 | 4.91 | 0.56 | -0.24 | 0.81 |
| | Female | 31 | 4.94 | 0.25 | | |
| **Total Decontamination and Cleaning** | Male | 78 | 4.06 | 0.77 | -2.82 | 0.01 |
| | Female | 31 | 4.52 | 0.72 | | |
| **Total Instruments Sterilization** | Male | 78 | 3.08 | 0.93 | -2.18 | 0.03 |
| | Female | 31 | 3.44 | 0.71 | | |

The results in the table above show that there are significant differences between males and females in terms of hand washing, decontamination and cleaning, and instruments sterilization (P-values<0.05): females (Mean=4.53) have hand washing more than males(Mean=4.16), females (Mean=4.52) have decontamination and cleaning more than males (Mean=4.06) and females (Mean=3.44) have instruments sterilization more than males (Mean=3.08).

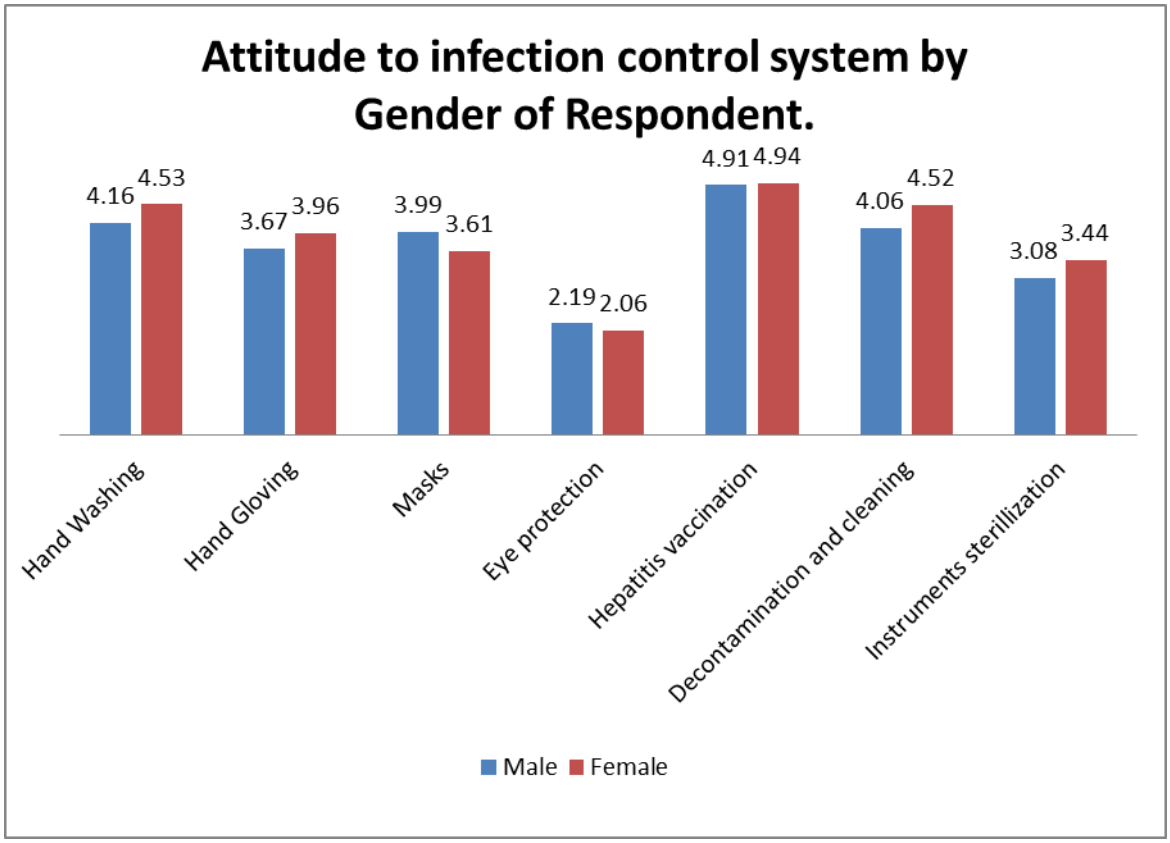



**Figure 4.2 Attitude to Infection Control System by Gender of Respondents.**

### 4.4 Infection Control Checklist for Dental Setting:

**Table 4.11 : Infection Control Checklist for Infection Control Program.**

| Infection Control Practice | Yes | | No | |
|---|---|---|---|---|
| | F | % | F | % |
| **Infection control program** | | | | |
| Are "standard precautions" followed by all patients? | 88 | 80.73% | 21 | 19.27% |
| Is there a written infection control program? | 8 | 7.34% | 101 | 92.66% |
| Are there methods for monitoring and evaluating the program? | 6 | 5.50% | 103 | 94.50% |
| Is there training for a dental health care person (initial and ongoing) in infection control policies and practices? | 6 | 5.50% | 103 | 94.50% |
| Is there a written exposure control plan? | 2 | 1.83% | 107 | 98.17% |
| **Total Infection control program** | 110 | 20.198% | 435 | 79.82% |

The results in the table above show that the standard precautions followed by all patients(80.73%), while there is no written infection control program(7.34%), and there are no methods for monitoring and evaluating the program (5.50%), there is also no training for dental health care persons (initial and ongoing) in infection control policies and practices (5.50%), finally, there is not a written exposure control plan(1.83%).

**Table 4.12: Infection Control Checklist for Immunization.**

| Infection Control Practice | Yes | | No | |
|---|---|---|---|---|
| | F | % | F | % |
| **Immunization** | | | | |
| Are DHCP adequately immunized against | 92 | 84.40% | 17 | 15.60% |

| | | | | |
|---|---|---|---|---|
| Hepatitis B disease? | | | | |

The results in the table above show that DHCP are adequately immunized against Hepatitis B disease(84.4%).

**Table 4.13 : Infection Control Checklist for Personal Protective Equipment (PPE).**

| **Infection Control Practice** | **Yes** | | **No** | |
|---|---|---|---|---|
| | **F** | **%** | **F** | **%** |
| **Personal protective equipment (PPE)** | | | | |
| Are you familiar with personal protection equipment? | 101 | 92.66% | 8 | 7.34% |
| Is personal protective equipment storage available and close to care? | 104 | 95.41% | 5 | 4.59% |
| Are facilities available to disinfect reusable PPE? | 71 | 65.14% | 38 | 34.86% |
| **Total PPE** | 276 | 84.40% | 51 | 15.60% |

The results in the table above show that personal protective equipment storage is available and close to care(95.41%), the respondents are familiar with personal protection

**Table 4.14 : Personal Protection Equipment Used in Clinical Practice?**

| **Personal Protection Equipment** | **%** |
|---|---|
| Gloves | 96.3% |
| Lap coat | 79.8% |
| Mask | 94.5% |
| Eye glasses | 13.8% |

The results in the table above show that the most personal protection equipment used in clinical practice are the gloves(96.3%), then the masks(94.5%), then the lap coat(79.8%) and the last are the eye glasses(13.8%).

**Table 4.15 : Infection Control Checklist for Sterilization and Disinfection of Patient-Care.**

| Infection Control Practice | Yes | | No | |
|---|---|---|---|---|
| | F | % | F | % |
| **Sterilization and Disinfection of Patient-Care Items** | | | | |
| Is there a policy for how and where contaminated instrument are cleaned and processed? | 81 | 74.31% | 28 | 25.69% |
| Are you familiar with methods for monitoring and evaluating of effectiveness of sterilization? | 56 | 51.38% | 53 | 48.62% |
| Is there adequate space for the processing area to be divided into clean and dirty area? | 22 | 20.18% | 87 | 79.82% |
| Is the chemical indicator tested with each load? | 20 | 18.35% | 89 | 81.65% |
| Is the sterilizer (s) spore tested at least weekly? | 0 | 0.00% | 104 | 100% |
| Are policies in place to handle positive testes, if the answer is yes in few words describe your policy? | 26 | 23.85% | 83 | 76.15% |
| Are handpieces cleaned, disinfected, lubricated, and sterilized between patients? | 17 | 15.60% | 92 | 84.40% |
| Are individual burrs either discarded or sterilized following each use? | 100 | 91.74% | 9 | 8.26% |
| Do you disinfect operatory equipment and surfaces between patients? | 46 | 42.20% | 63 | 57.80% |
| Are surfaces that are difficult to disinfect covered? | 15 | 13.76% | 94 | 86.24% |
| Are covers changed between patients? | 14 | 12.84% | 95 | 87.16% |
| **Total Sterilization and Disinfection of Patient-Care** | 402 | 33.11% | 797 | 66.89% |

The results in the table above show that the individual burrs are either discarded or sterilized after each usage (91.74%), and there is a policy for how and where contaminated instrument are cleaned and processed(74.31%). On the other hand, the sterilizer(s) spore are tested at least weekly(0.00%), covers are changed between patients(12.84%), surfaces that are difficult to disinfect are covered(13.76%), hand pieces are cleaned, disinfected, lubricated, and sterilized between patients(15.60%), the chemical indicator is tested with each load(18.35%), there is adequate space for the processing area to be divided into clean and dirty area(20.18%),and policies in place to handle positive testes is (23.85%) .

**Table 4.16 : Methods for Monitoring and Evaluating the Effectiveness of Sterilization in Dental Clinics:**

| Monitoring and Evaluating the effectiveness of Sterilization in Dental Clinics | F | % |
|---|---|---|
| Chemical indicator | 47 | 43.1% |
| Don't know | 62 | 56.9% |
| Total | 109 | 100.0% |

The results in the table above show that only the method of chemical indicator is used for monitoring and evaluating the effectiveness of sterilization in dental clinics(43.1%), while (56.9%) don't know.

**Table 4.17 : Policies in Place to Handle Positive Testes (Sterilization Faller ) in Dental Clinics:**

| Policies in Place to Handle Positive Testes in Dental Clinics | F | % |
|---|---|---|
| Depending on type of health services | 4 | 3.7% |
| No policy | 79 | 72.5% |
| Stop working | 26 | 23.9% |
| Total | 109 | 100.0% |

The results in the table above show that most of the respondents don't have policies in place to handle positive testes in dental clinics(72.5%), and 23% of the respondents stop working, while only 3.7% depend on the type of health services.

**Table 4.18 : Infection Control Checklist for Hand Hygiene.**

| Infection Control Practice | Yes | | No | |
|---|---|---|---|---|
| | F | % | F | % |
| **Hand Hygiene** | | | | |
| Do clinic personnel perform hand hygiene before and after treating patients? | 76 | 69.72% | 33 | 30.28% |
| Are alcohol hand rubs available? | 31 | 28.44% | 78 | 71.56% |
| Is staff properly trained in the use of alcohol hand rub products? | 19 | 17.43% | 90 | 82.57% |
| **Total Hand Hygiene** | 126 | 38.53% | 201 | 61.47% |

The results in the table above show that clinic personnel perform hand hygiene before and after treating patients(69.72%). On the other hand, staff is not properly trained to the use of alcohol hand rub products(17.43%), and alcohol hand rubs are not available(28.44%).

**Table 4.19.A : Infection Control Checklist Domains by Clinic Ownership.**

| Infection Control Practice | Public | | Private | | $\chi^2$ | P-value |
|---|---|---|---|---|---|---|
| | F | % | F | % | | |
| **Infection Control Program** | | | | | | |
| Are "standard precautions" followed by all patients? | 6 | 85.7% | 82 | 80.4% | 0.119 | 0.730 |
| Is there a written infection control program? | 1 | 14.3% | 7 | 6.9% | 0.531 | 0.466 |
| Are there methods for monitoring and evaluating the program? | 1 | 14.3% | 5 | 4.9% | 1.109 | 0.292 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Is there training for a dental health care person (initial and ongoing) in infection control policies and practices? | 1 | 14.3% | 5 | 4.9% | 1.109 | 0.292 |
| Is there a written exposure control plan? | 0 | 0.0% | 2 | 2.0% | 0.140 | 0.708 |
| Do you take patient medical history regularly, and if Yes, how did you treat patients with infectious disease, (carrier)? | 6 | 85.7% | 53 | 52.0% | 3.006 | 0.083 |
| **Immunization** | | | | | | |
| Are DHCP adequately immunized against Hepatitis B disease? | 7 | 100.0 % | 85 | 83.3% | 1.382 | 0.240 |
| **Personal Protective Equipment (PPE)** | | | | | | |
| Are you familiar with personal protection equipment? | 7 | 100.0 % | 94 | 92.2% | 0.593 | 0.441 |
| Is personal protective equipment storage available and close to care? | 7 | 100.0 % | 97 | 95.1% | 0.360 | 0.549 |
| Are facilities available to disinfect reusable PPE? | 2 | 28.6% | 69 | 67.6% | 4.404 | 0.036 |

**Table 4.19.B : Infection Control Checklist Domains by Clinic Ownership.**

| **Infection Control Practice** | **Public** | | **Private** | | $\chi^2$ | **P-value** |
|---|---|---|---|---|---|---|
| | **F** | **%** | **F** | **%** | | |
| **Sterilization and Disinfection of Patient-Care Items** | | | | | | |
| Is there a policy for how and where contaminated instrument are cleaned and processed? | 3 | 42.9% | 78 | 76.5% | 3.877 | 0.049 |
| Are you familiar with methods for monitoring and evaluating of effectiveness of sterilization? | 5 | 71.4% | 51 | 50.0% | 1.204 | 0.273 |
| Is there an adequate space for the | 1 | 14.3% | 21 | 20.6% | 0.162 | 0.688 |

| | | | | | | |
|---|---|---|---|---|---|---|
| processing area to be divided into a clean and dirty area? | | | | | | |
| Is the chemical indicator tested with each load? | 2 | 28.6% | 18 | 17.6% | 0.522 | 0.470 |
| Is the sterilizer(s) spore tested at least weekly? | 1 | 14.3% | 4 | 3.9% | 1.608 | 0.205 |
| Are policies in place to handle positive testes, if Yes, in few words describe your policy? | 3 | 42.9% | 23 | 22.5% | 1.487 | 0.223 |
| Are handpieces cleaned, disinfected, lubricated, and sterilized between patients? | 1 | 14.3% | 16 | 15.7% | 0.010 | 0.921 |
| Are individual burrs either discarded or sterilized following each use? | 5 | 71.4% | 95 | 93.1% | 4.075 | 0.044 |
| Do you disinfect operatory equipment and surfaces between patients? | 2 | 28.6% | 44 | 43.1% | 0.570 | 0.450 |
| Are surfaces that are difficult to disinfect covered? | 1 | 14.3% | 14 | 13.7% | 0.002 | 0.967 |
| Are covers changed between patients? | 1 | 14.3% | 13 | 12.7% | 0.014 | 0.906 |
| **Hand Hygiene** | | | | | | |
| Do clinic personnel perform hand hygiene before and after treating patients? | 5 | 71.4% | 71 | 69.6% | 0.010 | 0.919 |
| Are alcohol hand rubs available? | 4 | 57.1% | 27 | 26.5% | 3.028 | 0.082 |
| Is staff properly trained in the use of alcohol hand rub products? | 2 | 28.6% | 17 | 16.7% | 0.645 | 0.422 |

The results in the table above show that there are significant differences between public and private clinics in terms of availability of facilities to disinfect reusable PPE(P-value<0.05), whereas the private(67.6%) was higher than the public(28.6%).Also, there are significant differences between public and private clinics in terms of availability of policy for how and where contaminated instrument are cleaned and processed (P-value<0.05), whereas the private(76.5%) was higher than the public(42.9%).Additionally, there are

significant differences between public and private clinics in terms of discarding or sterilizing individual burrs following each use(P-value<0.05), whereas the private(93.1%) was higher than the public(71.4%).

**Table 4.20 :Compliance of the Infection Control Domains by Age Variable.**

| Domain | Age | N | Mean | Std. Deviation | F | P-Value |
|---|---|---|---|---|---|---|
| Hand washing | Less than 30 years | 16 | 4.33 | 0.85 | 0.261 | 0.853 |
| | 30-39 | 58 | 4.26 | 0.55 | | |
| | 40-49 | 26 | 4.29 | 0.56 | | |
| | 50 years or more | 9 | 4.11 | 0.66 | | |
| | Total | 109 | 4.27 | 0.60 | | |
| Hand gloving | Less than 30 years | 16 | 3.83 | 0.93 | 0.768 | 0.515 |
| | 30-39 | 58 | 3.83 | 0.81 | | |
| | 40-49 | 26 | 3.62 | 0.84 | | |
| | 50 years or more | 9 | 3.48 | 0.87 | | |
| | Total | 109 | 3.75 | 0.84 | | |
| Masks | Less than 30 years | 16 | 4.13 | 1.31 | 3.063 | 0.031 |
| | 30-39 | 58 | 4.07 | 1.02 | | |
| | 40-49 | 26 | 3.58 | 1.14 | | |
| | 50 years or more | 9 | 3.11 | 0.78 | | |
| | Total | 109 | 3.88 | 1.11 | | |
| Eye protection | Less than 30 years | 16 | 2.75 | 1.24 | 2.996 | 0.034 |
| | 30-39 | 58 | 2.09 | 0.88 | | |
| | 40-49 | 26 | 2.15 | 1.22 | | |
| | 50 years or more | 9 | 1.56 | 0.53 | | |
| | Total | 109 | 2.16 | 1.04 | | |
| Hepatitis vaccination | Less than 30 years | 16 | 4.69 | 1.01 | 1.651 | 0.182 |
| | 30-39 | 58 | 4.98 | 0.13 | | |
| | 40-49 | 26 | 4.88 | 0.59 | | |
| | 50 years or more | 9 | 5.00 | 0.00 | | |
| | Total | 109 | 4.92 | 0.49 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Decontamination and cleaning | Less than 30 years | 16 | 4.35 | 0.88 | 2.471 | 0.066 |
| | 30-39 | 58 | 4.32 | 0.73 | | |
| | 40-49 | 26 | 3.88 | 0.81 | | |
| | 50 years or more | 9 | 3.96 | 0.63 | | |
| | Total | 109 | 4.19 | 0.78 | | |
| Instruments sterilization | Less than 30 years | 16 | 3.61 | 1.00 | 2.343 | 0.077 |
| | 30-39 | 58 | 3.21 | 0.86 | | |
| | 40-49 | 26 | 2.96 | 0.87 | | |
| | 50 years or more | 9 | 2.84 | 0.70 | | |
| | Total | 109 | 3.18 | 0.89 | | |

The results in the table above show that there are significant differences in masks attributed to the age variable(P-value<0.05), the Post Hoc test showed that the age group(50 years or above) with mean=3.11 was lower than all the other groups. The results in the table above show that there are significant differences in eye protection attributed to age variable(P-value<0.05), the Post Hoc test showed that the age group(50 years or above) with mean=1.56was lower than others with mean

.

**Table 4.21 :Compliance of the Infection Control Domains by Years of Experience Variable.**

| Domain | Years of experience | N | Mean | Std. Deviation | F | P-Value |
|---|---|---|---|---|---|---|
| Hand washing | 1-3 years | 10 | 4.28 | 1.02 | 0.017 | 0.997 |
| | 4-5 years | 16 | 4.28 | 0.42 | | |
| | 6-10 years | 39 | 4.28 | 0.54 | | |
| | >10 years | 44 | 4.25 | 0.61 | | |
| | Total | 109 | 4.27 | 0.60 | | |
| Hand gloving | 1-3 years | 10 | 3.80 | 0.88 | 1.151 | 0.332 |
| | 4-5 years | 16 | 3.60 | 0.96 | | |
| | 6-10 years | 39 | 3.94 | 0.83 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | >10 years | 44 | 3.63 | 0.79 | | |
| | Total | 109 | 3.75 | 0.84 | | |
| Masks | 1-3 years | 10 | 3.90 | 1.45 | 2.151 | 0.098 |
| | 4-5 years | 16 | 4.19 | 0.98 | | |
| | 6-10 years | 39 | 4.10 | 1.05 | | |
| | >10 years | 44 | 3.57 | 1.09 | | |
| | Total | 109 | 3.88 | 1.11 | | |
| Eye protection | 1-3 years | 10 | 2.80 | 1.40 | 1.721 | 0.167 |
| | 4-5 years | 16 | 2.06 | 0.85 | | |
| | 6-10 years | 39 | 2.21 | 0.95 | | |
| | >10 years | 44 | 2.00 | 1.06 | | |
| | Total | 109 | 2.16 | 1.04 | | |
| Hepatitis vaccination | 1-3 years | 10 | 4.60 | 1.26 | 1.867 | 0.140 |
| | 4-5 years | 16 | 4.94 | 0.25 | | |
| | 6-10 years | 39 | 4.90 | 0.50 | | |
| | >10 years | 44 | 5.00 | 0.00 | | |
| | Total | 109 | 4.92 | 0.49 | | |
| Decontamination and cleaning | 1-3 years | 10 | 4.20 | 1.18 | 1.249 | 0.296 |
| | 4-5 years | 16 | 4.23 | 0.78 | | |
| | 6-10 years | 39 | 4.36 | 0.73 | | |
| | >10 years | 44 | 4.03 | 0.71 | | |
| | Total | 109 | 4.19 | 0.78 | | |
| Instruments sterilization | 1-3 years | 10 | 3.28 | 1.03 | 4.428 | 0.006 |
| | 4-5 years | 16 | 3.34 | 0.92 | | |
| | 6-10 years | 39 | 3.49 | 0.83 | | |
| | >10 years | 44 | 2.83 | 0.79 | | |
| | Total | 109 | 3.18 | 0.89 | | |

The results in the table above show that there are significant differences in instruments sterilization attributed to the years of experience variable(P-value<0.05). The Post Hoc test showed that the group(>10 years)with mean=2.83 was lower than the group(6-10 years) with mean=3.49.

**Table 4.22 :Compliance of the Infection Control Domains by Working Hours Per Week Variable.**

| Domain | Working Hours Per Week | N | Mean | Std. Deviation | F | P-Value |
|---|---|---|---|---|---|---|
| Hand washing | <35 hours per week | 6 | 4.88 | 0.31 | 3.443 | 0.036 |
| | 35 hours per week | 29 | 4.20 | 0.76 | | |
| | >35 hours per week | 74 | 4.24 | 0.53 | | |
| | Total | 109 | 4.27 | 0.60 | | |
| Hand gloving | <35 hours per week | 6 | 4.28 | 0.85 | 1.252 | 0.290 |
| | 35 hours per week | 29 | 3.71 | 0.80 | | |
| | >35 hours per week | 74 | 3.73 | 0.85 | | |
| | Total | 109 | 3.75 | 0.84 | | |
| Masks | <35 hours per week | 6 | 3.00 | 1.26 | 3.389 | 0.037 |
| | 35 hours per week | 29 | 3.66 | 1.20 | | |
| | >35 hours per week | 74 | 4.04 | 1.03 | | |
| | Total | 109 | 3.88 | 1.11 | | |
| Eye protection | <35 hours per week | 6 | 2.00 | 1.55 | 1.434 | 0.243 |
| | 35 hours per week | 29 | 1.90 | 0.98 | | |
| | >35 hours per week | 74 | 2.27 | 1.01 | | |
| | Total | 109 | 2.16 | 1.04 | | |
| Hepatitis vaccination | <35 hours per week | 6 | 5.00 | 0.00 | 0.685 | 0.506 |
| | 35 hours per week | 29 | 4.83 | 0.76 | | |
| | >35 hours per week | 74 | 4.95 | 0.37 | | |
| | Total | 109 | 4.92 | 0.49 | | |
| Decontamination and cleaning | <35 hours per week | 6 | 4.72 | 0.44 | 1.856 | 0.161 |
| | 35 hours per week | 29 | 4.06 | 0.93 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | >35 hours per week | 74 | 4.20 | 0.73 | | |
| | Total | 109 | 4.19 | 0.78 | | |
| Instruments sterilization | <35 hours per week | 6 | 3.30 | 0.85 | 1.265 | 0.286 |
| | 35 hours per week | 29 | 2.96 | 0.62 | | |
| | >35 hours per week | 74 | 3.26 | 0.97 | | |
| | Total | 109 | 3.18 | 0.89 | | |

The results in the table above show that there are significant differences in hand washing attributed to the working hours per week variable (P-value<0.05), the Post Hoc test showed that the group(<35 hours per week) with mean=4.88was higher than all of the other groups. The results in the table above show that there are significant differences in masks attributed to the working hours per week variable(P-value<0.05), the Post Hoc test also showed that the group(<35 hours per week) with mean=3.00was lower than all of the other groups

**Table4.23 :Compliance of the Infection Control Domains by Educational Level Variable.**

| Domain | Educational Level | N | Mean | Std. Deviation | T | P-Value |
|---|---|---|---|---|---|---|
| Hand washing | Specialist | 18 | 4.40 | 0.48 | 1.053 | 0.295 |
| | General | 91 | 4.24 | 0.62 | | |
| Hand gloving | Specialist | 18 | 3.87 | 0.90 | 0.651 | 0.516 |
| | General | 91 | 3.73 | 0.83 | | |
| Masks | Specialist | 18 | 3.94 | 0.87 | 0.265 | 0.792 |
| | General | 91 | 3.87 | 1.16 | | |
| Eye protection | Specialist | 18 | 2.50 | 1.29 | 1.549 | 0.124 |
| | General | 91 | 2.09 | 0.97 | | |
| Hepatitis vaccination | Specialist | 18 | 4.83 | 0.71 | -0.791 | 0.431 |
| | General | 91 | 4.93 | 0.44 | | |
| Decontamination and cleaning | Specialist | 18 | 4.17 | 0.79 | -0.154 | 0.878 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | General | 91 | 4.20 | 0.78 | | |
| Instruments sterilization | Specialist | 18 | 3.02 | 0.98 | -0.835 | 0.406 |
| | General | 91 | 3.21 | 0.87 | | |

The results in the table above show that there are no significant differences in all of the domains attributed to the educational level variable(all P-values>0.05).

# Chapter Five

# Discussion and Recommendation

## 5.1 Introduction

The purpose of this study was to assess the dentists perception and behavior towards the compliance with the Palestinian infection control protocol organized for all health care settings (not specific for dental clinics because in Palestinian there is not a dental specific infection control protocol), and worldwide protocols especially the American protocol for this part of primary health care.

## 5.2 Implementation of Infection Control Protocol in Dental Clinics

The study showed that most of the respondents(94.5%) did not receive any infection control training in the last two years, which reveals that there is inadequacy of infection control committees. The absence of those is responsible for the administration of this important part and who is responsible for providing the relevant committees (Dental Association or the Ministry of Health or both). If health care providers do not receive the proper training on the infection control protocol, its implication were showed differences in the quality of services. Most of respondents(89.9%) in this study emphasized on the feeling that they need to receive more training about infection control protocol. Most of them(80.7%) agree that there is inadequate surveillance and performance measures, and lack of follow up and supervision.

## 5.3 Compliance and Perception to Infection Control Protocol

### 5.3.1 Hand Washing

The CDC recommends that hand hygiene should be performed when hands are visibly soiled, after touching an object which is likely to be contaminated with blood or OPIM, before and after treating each patient, before and after gloving, or if the integrity of the glove is compromised (CDC, 2002).

Hand washing is considered as the most effective tool of preventing the transfer of microorganisms from health care providers to patients and vice versa. Microorganisms that cause health care acquire infection are most likely to be transmitted from the hands of health care workers.

Partt et al (2007) confirmed that the cross transmission of microorganisms in health care centers , either directly from hands, or indirectly from environmental sources via hands, is a major contribution factor in the current infection threats to patients.

In this study, the perception (attitude) to hand washing techniques between dentists was relatively high (78.2%). Some of them agree that wearing gloves is enough, and they can replace hand washing by gloves, which means that there is great knowledge and awareness of hand washing among dentists, on another hand, compliance (behavior) was relatively low 69.72% clinic personnel perform hand hygiene before and after treating patients, the availability of alcohol hand rubs was (28.44%), and the staff is properly trained in the use of alcohol hand rub products(17.43%) .

### 5.3.2 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) includes masks, gloves, eye protection and protective clothing (BDA February 2003P, CDC, 2003a)They are designed to protect the skin and mucous membranes of OHCW which may be exposed to blood or OPIM during dental treatment (CDC, 2003a). The use of PPE has increased globally over the years because guidelines have become more explicit(Gordon BL, et al., 2001)

Gloves: OHCW may come in contact with mucous membranes, blood or Other Potentially Infectious Materials(OPIM) during patient care; therefore, gloves are used to protect their hands as well as to prevent microorganisms presence in their hands from being transmitted to their patients (CDC .(1993), CDC ,1986). Based on their use, there are two types of medical gloves: non-sterile examination gloves, and sterile surgeon‘s gloves, both types

are manufactured for single use, thus, a new pair of gloves must be worn for every patient and discarded after each task (CDC, 2003a). The perception to hand gloves is relatively moderate (69,95%), the attitude to non-sterile examination hand gloving was(96.3%) high, which reflects good knowledge, but wear sterile gloves for invasive procedures received the lowest attitude score (42.2%), most of the dentists said that sterile gloves is not available easily, this might be due to the lack of knowledge and importance about the indications for sterile gloves usage. Most of respondents agree that gloves must be discarded between patients' treatments (96.3%), but not necessary to be discarded after each task to the same patient(45%), which might be due to the lack of knowledge of how contaminated gloves spread infection in environment is, and services in the clinics and how the infection might transfer from one tissue to another.

**Masks:** OHCP should wear mask to protect their mouth and nose from blood or other body fluids that may spatter during dental treatment (CDC (2003a), BDA, 2003P). Masks are also used to protect the patients from microorganisms generated by the mask wearer(CDC, 2003a)

The attitude to masks was relatively moderate(67.9%), which reflects mild perceptions about the indications for masks usage. In this study, the results show that there are significant differences in masks attributed to age variable(P-value<0.05), the Post Hoc test showed that the age group(50 years or above) with mean=3.11 was lower than all of the other groups. It was not popular when doctors began practicing dentistry before they were 25 years and more and continued on it, despite numerous calls for the need to use it, which explains the need to find the competent committees to encourage and enforce infection control system, and it shows that there are significant differences in masks attributed to the working hours per week variable(P-value<0.05), the Post Hoc test showed that the group(<35 hours per week) with mean=3.00was lower than all of the other groups, which supports the essay which indicates that if things were used for a long time, it becomes troublesome and employees who work long hours were less compliance than others.

**Eye Protection**: Protective eye wear is used to prevent both physical injury and microbial contamination with possible consequent infection to the eyes (Molinari JA, Harte JA ,2010). It must be worn to protect the eyes of OHCP from sprays or splashes of blood or saliva or debris that may be generated during dental treatment (CDC (2003a), BDA, 2003P).

The compliance to eye protection was very low(12.8%), which reflects least of knowledge and perceptions about the indications for eye protection usage. Most of respondents said that it was not practical to work with eye glass worn on because it affected their sight, this might be due to the lack of training of how it can be used or due to its low quality. A very high adherence (98%) to eye protection was observed among the American dentists (Puttaiah R, et al., 2009) when compared to the present study.

On another hand, the compliance to the availability of personal protective equipment and facilities to disinfect reusable personal protective equipment (PPE) was high (84.40%), which means that dentists are in need for more encouragement to the proper use of personal protective equipment in dental clinics. The results show that there are significant differences in eye protection attributed to the age variable(P-value<0.05), the Post Hoc test showed that the age group(50 years or above) with mean=1.56 was lower than others, this corresponds with an explanation of the use of masks for this age group.

### 5.3.3 Hepatitis Vaccination

According to communicable disease center, all OHCP should be immunized before they are placed in risk situations where they may become susceptible to transmission of infections (CDC, 2003a). Hepatitis B vaccine consists of three doses of intramuscular injections. The second and third doses should be introduced one and six months after the first dose respectively (Molinari JA, Terezhalmy GT., 2010). The vaccine is effective on individuals who produce >100mIU/mI level of antibodies to Hepatitis B surface antigen (anti-HBs). The antibody level (anti-HBs) should be measured 2 – 4 months after completion of the course of vaccination. A single booster dose five years after completion of vaccine course is recommended for OHCW who have contact with blood or OPIM.

The attitude to hepatitis vaccination was very high(98.2%), which reflects good perceptions about the importance of the Hepatitis vaccination for both health care providers and patients. On the other hand, the analysis results show that (84.4%) are adequately immunized against Hepatitis B disease, (as confirmed by doctors but not by laboratory test).

### 5.3.4 Decontamination and Cleaning

Surfaces that do not come in direct contact with patients are known as environmental surfaces. They are of two types: clinical contact surfaces (e.g. light handles, switches, radiograph equipment, pens etc.) and housekeeping surfaces (e.g. walls and floors). Some of these surfaces can act as a reservoir for bacterial contamination and can be indirectly associated with transmission of infections mainly through the hand contact. This indicates that hand hygiene has an important role to play in reducing the transmission of infection through this route. Other methods are cleaning and disinfection of the environmental surfaces and the use of barrier protection (CDC, 2003a)The use of barrier protection is preferred, especially for those surfaces which are difficult to clean (Miller CH, Palenik CJ. , 2001).

The perception (attitude) to decontamination and cleaning methods was relatively good(80.4%), most dentists agree that surfaces and operatory equipment are cleaned using a medical approved disinfects daily or more often as needed, but not between patients, and most of the respondents(82.6%) agree that sinks and toilets are cleaned up daily or more often as needed, and 82.6% agree that instruments are cleaned up with soap and water prior to sterilization. On other hands, 42.20% was disinfect operatory equipment and surfaces between patients, least of them(13.76%) covered surfaces that are difficult to disinfect, and 12.84% of them are not changed by these covered between patients, which shows weakness in compliance to decontamination and cleaning . The results in the analysis show that there are significant differences between public and private clinics in favor of private in decontamination and cleaning(P-value<0.05), the private clinics(Mean=4.24) have decontamination and cleaning more than public clinics(Mean=3.48),and there are significant differences between public and private clinics in terms of the availability of policy for how and where contaminated instrument are cleaned up and processed(P-value<0.05), whereas the private(76.5%) were higher than the public(42.9%).This indicates the desire to encourage customers to receive treatment in private clinics, which contributes on their income, but in the governmental clinics, few reviewers do not affect the income because the income is constant, which means the need to find incentives, policy, and to find an appropriate space for the clinics to encourage government employees in order to improve the quality of work.

The results show that there are significant differences between males and females in terms of hand washing, decontamination and cleaning, and instruments sterilization(P-

values<0.05): females (Mean=4.53) have hand washing more than males(Mean=4.16), females (Mean=4.52) have decontamination and cleaning more than males (Mean=4.06) and females (Mean=3.44) have instruments sterilization more than males (Mean=3.08).This explains the presence of a female instinct commitment to clean more than a male.

### 5.3.5 Instruments Sterilization

Steam under pressure (autoclaving) was the method of sterilization used by all respondents. This is the most widely used, reliable, and economical method (Miller CH, Palenik CJ. , 2001)., and is the method of choice as recommended by the BDA (BDA, 2003P) The compliance instruments sterilization received a low score.

### Sterilization of Handpieces

Most of the respondents(15.60% only sterilized handpieces) agree that they did not sterilize handpieces after each patient's treatment, and they were enough with cleaning it with alcohol, (sterilization of handpieces is strongly recommended and autoclaving is the preferred method). Surface disinfection and/or immersion in chemical germicides are both unacceptable methods (CDC, 2003a, Molinari JA, Terezhalmy GT., 2010) The most common method used for handpieces sterilization in the present study was surface disinfection. This procedure does not disinfect interior portion of the handpieces. This is far below the current recommendation. These findings were concurred with that of a recent study carried out in Turkey in which the majority of dentists also reported using surface disinfection for sterilizing handpieces (CDC., 2008). Some doctors explained that they do not have a sufficient number, most of them have either one or two of handpieces, and less owns three, and this is interpreted as a lack of equipment.

### Sterilization of Burrs

Relatively high of respondents (91.74%) agree that the individual burrs are either discarded or sterilized after each use, burrs is a working part which is connected to handpieces, so if handpieces is not professionally sterilized, then burrs are easily decontaminated, which might be due to the lack of knowledge and skills about the mechanism of transfer of germs from sterile to non-sterile items. Most of dentists (94.5%) agree that autoclave is the effectiveness approved by the method of sterilization. In this study, there are significant differences between public and private clinics in terms of discarding or sterilizing individual burrs after each use(P-value<0.05), whereas the private(93.1%) was higher than the public(71.4%), this is interpreted as a lack of equipment, which confirmed orally by doctors.

**Monitoring of Sterilization**

**Monitoring of sterilization** refers to the use of mechanical, chemical and biological indicators to evaluate the sterilizing condition and the effectiveness of the procedure (CDC , 2003a, Harte, JA and Molinari, JA.**,** 2010)

**Mechanical indicators** are used to evaluate time, temperature and pressure of each sterilization cycle by observing criterion and offering of sterilizer (CDC, 1993). Correct readings do not ensure perfect sterilization, but incorrect readings indicate the possibility of a problem.

**Chemical indicators** are sensitive chemicals used to evaluate the physical situations of sterilization (e.g. time and temperature) during each cycle. The color of the indicator is changed when proven parameters are reached. Chemical indicators do not ensure sterilization, but they are used to recognize any errors that may occur during the sterilization process.

They are of two types: external and internal. External chemical indictors are located outside the instrument packaging and are used to show that the packaging has been processed through a sterilization cycle. Internal chemical indicators, on the other hand, are used to confirm that the sterilization agent has penetrated the wrapping material and reached the instrument. Only 18.35% of respondents agree that a chemical indicator was tested with each load.

**Biological indicators** is the most reliable method for sterilization monitoring (ADA , 1996). as it directly assesses the killing of known highly resistant microorganisms rather than merely evaluating chemical and physical conditions required for sterilization (CDC , 1993). It is necessary to verify that the sterilizer is functioning correctly by the use of the Biological Indicator (BI) at least once a week (CDC , 1993), Dougherty, L. , Lister, S. , 2011). No one agrees that the biological indicator was used in his work.

Only 45.5% of respondents agree that routine verification, that the sterilization method is functioning properly, is necessary, but nearly half of them(51.38%) are not familiar with methods for monitoring and evaluating of sterilization effectiveness (lack of knowledge and skills), most of the dental clinics (79.82%) did not have an adequate space for the processing area to be divided into clean and dirty area, this is interpreted that the clinic size is inadequate, which clearly appears in government clinics, in which there is only one room used to perform all tasks.

There is no suitable policy(76.15%) in place to handle positive testes (sterilizer malfunction). In private clinic minority of respondents said that stop work completely, but most of them agree that stop work or continuity depends on the procedure; for example, a cavity preparation you could do in spite of sterilization field they think that such a procedure is safe, forget that dentinal tubules or accidently opening dental pulped; for example, easily transfer microorganisms, this confirms our belief that this might be due to the lack of knowledge and skills about the mechanism of transfer of microorganisms, on the contrary, in public settings, all respondents agree that must stop work completely until the problem is solved, which supports the belief that the desire to increase an income has a profound impact on the quality of work, (income of doctors at governmental clinics is not affected by stop-work) .

Sterilizing equipment in dental clinics is one of the most important factors which affects the quality of the prevention of the infection spread which got a low score(33.11%) of compliance according to this study, and this gives the indication of fragility of the infection control system in dental clinics in Hebron district which requires the development of a new policy to develop the infection control system.

## 5.4 Conclusion

In conclusion, the findings of this study highlight the needs for strict adherence to infection control protocol in dentists. Evidence has suggested that infection control procedures can reduce the risk of disease transmission by compliance to a standard infection control protocol.

Although studies on compliance with infection control guidelines exist, some aspects of this issue have not been studied; for example, the quality of the water from dental units used in Hebron, Palestine, sterilize dental impressions before sending to the laboratory and others. Of those which have been accorded attention to, the following problem areas were identified in order to improve compliance to infection control recommendations in Hebron, Palestine. There is a need to increase the knowledge among dental professionals on the risks and routes of disease transmission in the dental office; although gloves are worn, they are not replaced after every task(55%), and hands are not washed before and after donning them(30.28%), most of the respondents admit that they did not wear sterile gloves(42.2% only wear sterile gloves for invasive procedure), because it they were not available and were not discarded after each task(55%). Masks are worn by 67.9% of the dentists. Protective eye-wear is worn by few dentists (12.8%). Most practitioners use autoclaves(99.1%), but 100% of them have never used a biological indicator for monitoring the effectiveness of sterilization, and only 18.35% of respondents agree that chemical indicator are tested with each load, sterilization monitoring are routinely procedures that verify the sterilization process to help assure patient protection. Chemically indicator and biological monitors should be used to check for proper functioning of an office sterilizer and many still use disinfectants; for example, handpieces are not sterilized between all patients, and they were satisfied cleaning them with alcohol. Most of the dental practitioners seem to be immunized against Hepatitis B(84.4%) .

The use of barrier protection is preferred, especially for those surfaces which are difficult to clean (Miller CH, Palenik CJ.,2001) In the literature different levels of adherence to this recommendation that have been reported, all were better than the present study since, for example, some of the dentists of the current study participants reported the use of protection barriers to cover surfaces that were frequently touched by the dental personnel – the given reason because they did not allow others to think that was necessary.

The goal of a dental infection-control program is to provide a safe treatment environment for the patient and a safe working environment for the health care workers. This is accomplished by reducing the risk of health-care associated infections in patients and occupational exposures in health care providers. An effective program evaluation is a systematic way to ensure that procedures are useful, feasible, ethical and accurate. It is important to evaluate the program to improve the effectiveness of the infection prevention, control, and dental practice protocols. Such program evaluation should be integrated into the day-to-day management of the infection prevention and control program.

A successful infection prevention and control program depend on developing standard operating procedures, evaluating practices, routinely documenting adverse outcomes, and monitoring healthcare-associated infections in patients. Checklists of document procedures, periodic observational assessments, and routine review of occupational exposures to blood-borne pathogens can include strategies and tools to evaluate the infection-control program.

If deficiencies or problems in the implementation of infection-control procedures are identified, further evaluation is needed to eliminate the problems. Effective implementation of infection prevention and control programs is in an ongoing process, requiring providers to stay current with knowledge of emerging infectious diseases.

Information and recommendations will continue to evolve. Dentists are encouraged to stay abreast of the latest guidelines and continually evaluate their infection control strategies and policies to ensure a safe environment that protects themselves as well as their patients and staff.

### 5.5 Recommendation

A lack of compliance towards infection control was a general feature of the findings of this research. It highlights the need of infection control education that starts at dental training colleges and is followed through after graduation with Continuing Professional Development (CPD).

Depending on the results of this study, the dental sector requires national infection control guidelines to be developed using current international standards that are adapted to state and regional needs of the country. In this regard, it is anticipated that the findings of the

current study will provide some of the required baseline information to develop such national guidelines.

Assessment of the infection control system in the Palestinian oral health unit pointed out several recommendations at several levels.

**Ministry of Health Level**

1. Establish an infection control committee that will be responsible for planning, monitoring and controlling, and evaluation of infection control in all of the oral health care settings (public and private clinics). This proposed committee will also be responsible for developing and updating infection control polices and guidelines, identifying training needs, and designing of training modules.

2. Oral Health Unit (OHU) undertakes periodic surveys or \ and regular check up to guarantee that the knowledge and skills of OHCPs are preserved, to identify any weaknesses, and modify the training according to the obtained results. This may positively affect the awareness of the importance of infection control among OHCPs.

3. Creating a particular infection control department in all health care offices in all of the districts of the country.

4. Providing formal and obligatory training (initial and ongoing) in infection control program for all dentists and their assistances with the mandatory attendance to improve their knowledge and skills toward the implementation of effective infection control measures.

5. Disseminating the infection control guidelines manual for dental practice that has already been developed by the Ministry of Health, and that should be available to the dental clinics, and

6. Creating a number of specialists in the field of infection control by encouraging specialization of infection control by determining a number of scholarships in the major of infection control.

**Health Offices and Hospital Administration Level**

1. Offering post immunization test(s) for all of the health workers in dental clinics, and performing (a) regular check-up(s) for health workers to make sure they are free of any infectious diseases.

2. The administration of the hospitals and dental centers must develop patient records which is one of the main basic steps of a successful implementation of infection control system, (which helps in identifying infection sources, when, how and where a patient is treated is very important to achieve this goal).

3. Paying attention to training, consulting, workshops, and providing the necessary materials, tools and supplements to the clinics to avoid reusing of the same material.

**Patients Level**

A patient's medical history is a vital part of his or her dental history and increases the dentist's awareness of diseases and medication which might interfere with the patient's dental treatment, so dentists must take it regularly**.**

Patients must be willing to openly disclose their current health status, and must encourage doing that to avoid transmitting the infection to the staff and other patients.

**General Recommendations**

1. For future studies, increasing the sample size and the inclusion of other districts to evaluate infection control practice would certainly allow greater generalizability of the results and lead to more solid findings.

2. Assess actual infection control practices by sampling instruments and devices and culture them and check their sterilization status.

3. Assessment of patients perception of dental clinics and their confidence towards infection control practices.

4. Assessment of infection control system at other parts of health care setting, especially general medical clinic maternity units in public and private sector.

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**Annex 1**

**QUESTIONNAIRE**
**Personal and Professionals Information**

| | | | |
|---|---|---|---|
| **1**.Gender: ☐ M ☐ F | Age: …….. | No : ……. | |
| **2.**Years of experience | ☐Less than 1years ☐ 1-3 years ☐ 3-5 years ☐ 6-10 years ☐> 10 years | | |
| **3.** Educational level. | Specialist ☐ | General ☐ | |
| **4.**Ownership. | Public ☐ | Private ☐ | |
| **5**.working hours per week | <35 hours per week ☐ | 35 hours per week ☐ | >35 hours per week ☐ |

| | | | | |
|---|---|---|---|---|
| **6.**Have you received any infection control training courses in the last two years? | ☐ | Yes | ☐ | No |
| **7.**Do you have access to infection control protocol when you need it? | ☐ | Yes | ☐ | No |
| **8.** Do you feel you need to learn more about infection control training protocol? | ☐ | Yes | ☐ | No |
| **9.**System enforce implementation of infection control protocol at the clinic | ☐ | Yes | ☐ | No |

**Please indicate your agreement or disagreement with the following statements that describe Your perception /behavior:**

| **Hand Washing** | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| **10**.Wash hands before and after touching the patient | | | | | |
| **11.**Wash hands before performing invasive Procedure | | | | | |
| **12.**Wash hands when visibly soiled, or after touching mucus membranes, blood and body fluids. | | | | | |
| **13.**Replace hand wash with alcohol hand rub when hands are visibly clean. | | | | | |
| **Hand Gloving** | | | | | |
| **14**. Wear gloves prior to contact with blood and body fluids from all patients. | | | | | |
| **15.**Wear sterile gloves for invasive procedures only | | | | | |
| **16.** Gloves are discarded between patients. | | | | | |
| **17**.Gloves are discarded after each task | | | | | |
| **Masks** | | | | | |
| **18.** Masks always used when working with patient. | | | | | |
| **Eye protection** | | | | | |
| **19.**Eye protection always used when working with Patient for both patient and client. | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Hepatitis vaccination** | | | | | |
| **20.**All workers involved with patient treatment must received Hepatitis B vaccinations. | | | | | |
| **Decontamination and cleaning** | | | | | |
| **21.**Surfaces that come with direct contact to body fluids as counters, chairs etc, are cleaned using a medical approved disinfects. | | | | | |
| **2.**Sinks and toilets are cleaned daily or more often as needed. | | | | | |
| **23.**Instruments are cleaned with soup and water prior to sterilization. | | | | | |
| **Instruments sterilization** | | | | | |
| **28.**Handpieces sterilized following each patient treatment. | | | | | |
| **29.**Individual burrs either discarded or sterilized following each use. | | | | | |
| **30.**All instruments involved in clinical patient care sterilized following each patient treatment. | | | | | |
| **31.**Approved method of sterilization use : | | | | | |
| a- Autoclave. | | | | | |
| b- Dry Heat. | | | | | |
| c- Heat/Chemical Vapor. | | | | | |
| **32.**Routine verification that the sterilization method is functioning properly is necessary. | | | | | |
| **33.**Clean, disinfect, and sterilize items in a separate area maintained for this purpose. | | | | | |

**Annex 2**

**Infection control checklist for dental setting**

| **Infection control practice** | **Yes** | **No** |
|---|---|---|
| **1- Infection control program** | | |
| Are "standard precautions" followed for all patients? | | |
| Is there a written infection control program? | | |
| Are there methods for monitoring and evaluating the program ? | | |
| Is there a training for dental health care personal (initial and ongoing ) in infection control policies and practices ? | | |
| Is there a written exposure control plan? | | |
| Do you take patient medical history regularly and if the answer is yes how did you treat patient with infectious disease, (carrier)? . | | |
| **2- Immunization** | | |
| Are DHCP adequately immunized against Hepatitis B disease ? | | |
| **3- Personal protective equipment (PPE)** | | |
| Are you familiar with personal protection equipment? | | |
| If yes what you use in your clinical practice?<br>a. . b. .<br>c. . ….d. . | | |
| Is personal protective equipment storage available and close to care? | | |
| Are facilities available to disinfect reusable PPE? | | |
| **4- Sterilization and Disinfection of Patient-Care Items** | | |
| Is there a policy for how and where contaminated instrument are cleaned and processed ? | | |
| Are you familiar with methods for monitoring and evaluating of effectiveness of Sterilization ? | | |
| If the answer of the above statement is yes which methods used in your clinic ?<br>a. **b.** **c.** **.** | | |
| Is there adequate space for the processing area to be divided into clean and dirty area ? | | |
| Is the chemical indicator tested with each load? | | |
| Is the sterilizer (s) spore tested at least weekly? | | |
| Are policies in place to handle positive testes, if the answer is yes in few words describe your policy ? | | |
| Are handpieces cleaned, disinfected, lubricated, and sterilized between patients? | | |

| | | |
|---|---|---|
| Are individual burrs either discarded or sterilized following each use? | | |
| **Sterilization and Disinfection of Patient-Care Itemscontinue** . | | |
| Do you disinfect operatory equipment and surfaces between patients? | | |
| Are surfaces that are difficult to disinfect covered? | | |
| Are covers changed between patients? | | |
| 5- **Hand Hygiene** | | |
| Do clinic personnel perform hand hygiene before and after treating patients? | | |
| Are alcohol hand rubs available? | | |
| Is staff properly trained in the use of alcohol hand rub products? | | |

## Annex 3

**تقييم نظام مكافحة العدوى والإجراءات المتبعة في عيادات صحة الفم والأسنان في محافظة الخليل ووجهات نظر أطباء الأسنان من اجل مراقبة انتقال العدوى وسلامة المرضى**

**أعزائي المشاركين**

**تحية طيبة وبعد**

**يهدف هذا البحث إلى تقييم نظام مكافحة العدوى والإجراءات المتبعة في عيادات صحة الفم والأسنان في محافظة الخليل ودراسة مدى تقيد الأطباء بالبروتوكولات الموصى بها وآرائهم حول مراقبة انتقال العدوى وسلامة المرضى**

**علما بأن هذا البحث يتم بموافقة وحدة الفم والأسنان في وزارة الصحة الفلسطينية .**

**المشاركة في الدراسة طوعية وان السرية التامة حول هوية الشخص الذي قام بتعبئة الاستلانة مضمونة وان الاستبيانات لا تحتوي على أسماء المشاركين واستعملت الأرقام من ترقيم الاستبيانات في هذا البحث.**

**شكرا جزيلا لكم لتعاونكم**

**جامعة القدس**