An-Najah National University

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Cross-Infection and Infection Control in Dental Clinics In Nablus and Tulkarm Districts

By

Areej Bassam AL-Sabbah

Supervisors

Dr. Wafaa Menawi

Dr. Lubna Al kharraz

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This thesis was Defined Successfully on 20 /02/2021 and Approved By:

Defense Committee Members		**Signature**
1. Dr. Wafaa Menawi	**/ Supervisor**	----------
2. Dr. Lubna Kharraz	**/ Co- Supervisor**	----------
3. Dr. Elham Kateeb	**/ External Examiner**	----------
4. Dr. Abdulsalam Al Khayyat	**/ Internal Examiner**	----------

Dedication

To all who supported me all the time. To all those who believed in my abilities to achieve what I want.

To my husband, the secret of my success who was and still the first supporter supporting me at the time of fun and frustration. My husband without your continued support and your continued cooperation, I would not arrive here. You always keep me confident that I would become what we always strive for.

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انا الموقع ادناه مقدم رسالة تحت عنوان:

Cross-Infection and Infection Control in Dental Clinics in Nablus and Tulkarm Districts

اقر بان ما اشتملت عليه هذه الرسالة هو نتاج جهدي الخاص، باستثناء ما تمت الإشارة اليه حيثما ورد، وان هذه الرسالة لم تقدم من قبلي لنيل اي درجة علمية، او اي بحث علمي او بحثي لأي مؤسسة تعليمية او بحثية اخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researchers' own work and has not been submitted elsewhere for any other degree or qualification.

Students Name: أسم الطالبة: اريج باسم يوسف صباح

Signature: التوقيع:

Date: التاريخ: 20.2.2021

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List of Abbreviations

ADA	American Dental Association
AIDS	Aqueous Immune Deficiency Syndrome
BI	Biomedical Indicators
CDC	Center of Disease Control and Prevention
COVID-19	Coronavirus Disease 2019
CWC	Certified Biomedical Waste Carrier
FDI	World Dental Federation
HBV	Hepatitis B Virus
HCHO	Formaldehyde
HCV	Hepatitis C Virus
HICPAC	Healthcare Infection Control. Practices Advisory Committee
HIV	Human Immunodeficiency Virus
HVE	High Volume Evacuator
ICM	Infection Control Measures
NICE	National Institute for Health and Care Excellence
NSIS	Contaminated Needle Stick and Sharp Injuries
OHCW	Oral Health Care Workers
OSHA	Occupational Safety and Health Administration
PIM	Potential Infectious Materials
PMOH	Palestinian Ministry of Health
PPE	Patient Protective Equipment's
SUD	Single-Use Device
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus
TB	Tuberculosis
UK	United Kingdom
UN	United Nations
UNORWA	United Nations Relief and Works Agency for Palestine Refugees in The Near East
USA	United States of America
WHO	World Health Organization

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Abstract

Background: Infection control had many developments in the last few years, especially in the COVID 19 pandemic, in spite of this, there were many complications in different health care facilities as well as dentists' clinics' work nature due to the lack of infection control knowledge and compliance failure.

Aim: To assess the level of knowledge, attitude and compliance with the infection control measures in the public and private dental clinics in Nablus and Tulkarm districts, Palestine.

Method: A universal Sampling was used to assess the infection control program at the dental clinics in Nablus and Tulkarm District. The study was planned to take place under normal health circumstances, while the data have been collected during COVID 19 pandemic. Thus, the study was greatly influenced and reflected the compliance with infections and control measures in dental clinics in COVID 19 era. The study sample involved 265 dentists. Data was collected using a questionnaire which has been sent via email between July and August 2020. A pilot study was carried out on a random sample of 20 dentists from the Jenin district after permission had been obtained. Descriptive statistics, Chi-square test, One-

way ANOVA and Post-Hock tests have been used. Statistical significance was set at ″P <0.05″. Cronbach's alpha and internal validity have been conducted to ensure the reliability and validity of the questionnaire.

Findings: The study sample involved 265 dentists. Regarding the demographic characteristics of participants, two-thirds of the total number of the sample size were male, general practitioner constituted (75.1%) and participants from (Nablus) were (56.2%). The study participants had different years of experience between (<5 and >20). Finally, concerning the ownership variable, the percentage of category (private) was (89.1%), (government) was (9.1%) and (UNRWA) was (1.8%) from the total number of the sample size. (78.50%) of the participants believed that they needed to learn more about infection control measures.

The results showed that the total positive response regard all infection control domains mentioned in the study were (70.0%). Whereas the participants gave the highest positive response for personnel protective equipment; gloving (96.10%), face masking during dental procedures (77.70%), wearing protective clothing, head cap and white coat (76.30%), hand washing (76.10%), vaccination against HBV (74.50%), eye protection (74.30%) and. They gave the instruments related controls the lowest responses; instruments sterilization were (59.40%), and aerosol control, accident management, and monitoring autoclave were (55.1%, 55.30%, and 47.20%) respectively. Except for the surfaces decontamination with the responses of (78.00%).

The results showed that there were significant differences between males and females in terms of accident management ″p=0.016″, the T-test showed that the male group (M) (Mean=0.73) was better than in the female group (F) (Mean=0.64). The results also appeared that there was a significant difference between a general practitioner and specialist groups in wearing gloves ″p=0.009″ domain as the specialist group (Mean=2.70) of dentists is better than a general practitioner (G.P) group (Mean=2.48). The specialists applying instrument sterilization ″p=0.004″ (Mean=0.55) are less than (G.P) (Mean=0.62). The study released that there was a significant difference between the two Governorates (Nablus and Tulkarm) in seven domains; wearing gloves ″p=0.001″, wearing protective clothing ″p=0.035″, hand washing ″p=0.000″, instruments sterilization ″p=0.001″, decontamination and cleaning surfaces, using disposable protection barriers to cover some surfaces ″p=0.001″, aerosol control ″p=0.008″ and accident management ″p=0.003″. Thus, all results about the compliance with infection control domains were always better in Tulkarm than in Nablus Governorate. The study also showed that there were significant differences in wearing eye protection ″p=0.005″, wearing protective clothing ″p=0.000″, hand washing ″p=0.000″ instruments sterilization ″p=0.000″, monitoring autoclave ″p=0.02″, decontamination and cleaning surfaces, using disposable protection barriers to cover some surfaces ″p=0.000″, aerosol control ″p=0.035″ and accident management domains ″p-=0.001″ attributed to the years of experience variable ″P<0.05″. The Post-Hoc test showed that the group of (<5 years) was the best in many times between all other groups (wearing gloves, hand washing, instrument sterilization, decontamination, and cleaning surfaces, using disposable protection barriers to cover some surfaces, accident management, and aerosol control domains). In the same vein, the study showed that there were significant

differences in wearing a face mask during the dental procedure ″p=0.033″, wearing eye protection ″p=0.003″, wearing protective clothing ″p=0.001″, head cap and white coat ″p=0.001″, hand washing ″p=0.000″, monitoring autoclave ″p=0.009″, decontamination and cleaning surfaces, using disposable protection barriers to cover some surfaces ″p=0.000″ and aerosol control ″p=0.04″ domains attributed to the ownership variable ″P<0.05″. The Post-Hoc test showed that the UNRWA group was the worst among all of the groups in applying some of the infection control measures such as wearing a face mask with ″p=0.033″, wearing eye protection ″p=0.003″, wearing protective clothing, a head cap, and a white coat ″p=0.001″, hand washing ″p=0.000″, monitoring autoclave ″p=0.009″, decontamination and cleaning surfaces, using disposable protection parries to cover some surfaces ″p=0.000″, and finally accident management ″p=0.047″.

Conclusion: The findings of this study showed that there is a moderate implementation of infection control protocol in Nablus and Tulkarm dental clinics. Thus, there is a need to strengthen the adherence to infection control measures.

Chapter One
Introduction

1.1 Introduction

Dental care practices are not risk-free (Yamalik and Dijk, 2013). So, appropriate safety precautions should be taken within the dental environment to prevent cross-infection transmission among patient-patient or patient-dental staff (McCacarthy and Briton, 2000).

Today, the globe lives the ghost of Corona Virus disease, and it is the most appropriate time to emphasize the importance of cross-infectious disease and infection control measures, especially in a dental environment where direct contact with all infected and uninfected people occurs. This Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) started in Wuhan, China in 2019 as pneumonia, according to World Health Organization (WHO) (Kochhar, Bhasin, Kochhar and Dadlani, 2020a). In the beginning, Coronavirus Disease 2019 (COVID-19) transmitted from animal to human (Zoonotic infection), then from human-to-human by microdroplets in a distance less than 2 meters between an infected patient and another person with a direct exposure duration period of about 15 minutes. Core droplets also can spread out of infected patients by coughing or sneezing and remain in aerosol to be transmitted to another person (Suri, Vandersluis, Kochhr, and Abdallah, 2020) with an incubation period ranging from 5 to 14 days (Bertoli, Veritti, Danece, Samassa and Sarao, 2020). SARS-CoV-2 has an epidemic potential (Ro) ranges between 1.4

and 6.5 (Riou and Althaus, 2020) and add a new definite risk for cross-infection transmission with SARS-CoV-2 in dental sitting (Spagnuolo, De Vito, Rengo and Tatullo, 2020) as well as very dangerous infectious disease because it can transmit from asymptomatic carriers (Bai, Yao, and Wei, 2020) and during the incubation period (Fuk-Woo Chan, Yaun, Kai-Wang To, Chu and Yang, 2020). Some oral features can be considered as early symptoms of COVID-19 so it can be detected before other clinical symptoms features (like xerostomia, dysgeusia/ ageusia, and ulcers or other exanthemata's lesions, besides some Self-divulged symptoms like loss of taste and smell) which can allow the dentist to discover the disease early (Kochhar, Bhasin, Kochhar and Dadlani, 2020b).

In dental clinics, a white-coat, a dental instrument, and a dental unit are susceptible to the splatter by blood, aerosol and saliva, trauma, or inoculation by contaminated instruments, so there is a definite risk for cross-infection transmission with SARS-CoV-2 and other infectious pathogens (Piryani, Shrestha and Neupane, 2018). Patients who carry blood-borne viruses or any other infections are usually unaware of their health conditions, so infection control measures have to be applied for all patients who visit dental clinics (Siege, Rhinehart, Jackson and Chiarello, 2007). According to a report published by the World Health Organization (WHO) in July 2019 - Viral Hepatitis B and C affect (325) million people worldwide, causing (1.4) million deaths a year, and it is the second infectious killer disease after tuberculosis (WHO, July (2019)), also (9) times more patients are infected with hepatitis virus than Acquired Immune

Deficiency Syndrome (AIDS) (WHO, July (2019)). About AIDS, by the end of June 2019, WHO published that (24.5 million) people were accessing Antiretroviral therapy (WHO, 09 July (2020)).

One-fifth of all deaths in the world (approximately 10 million deaths) in (2016) is because of infectious diseases. The lower respiratory tract infections are the highest mortality rate, followed by tuberculosis, AIDS, malaria, and enteric infections (GBD 2017 DALYs and HALE Collaborators, 2018).

Although Palestine has low endemicity with a low prevalence of Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) according to the Palestinian Ministry of Health (PMH) reports (2019); there were (102) cases affected with the (HIV) between 1988 and 2018, (HBV) was (31) cases in 2018, the number of carriers of (HBV) was (781), and the number of cases affected with (HCV) was (6) cases while the number of carriers reported with the (HCV) was 156 cases in the same year (Palestinian Health Information Center (PHIC) - MOH, Jul-2019). Other Infectious diseases like Coronavirus disease (Coronavirus - COVID19 Surveillance System, 2020) and Tuberculosis (TB) are increasing in the Middle East and North Africa (Araj, Saade, Itani, and Avedissian, 2016), so we can’t negate the importance of implementation of infection control measures.

Some infectious diseases are not fatal, but cause disability and have a high substantial burden on public health, for example, trachoma and onchocerciasis are not fatal, but they can lead to loss of vision and have a significant impact on health as well as increase the medical expenditure (Porth, Deiotte, Dunn and Bashshur, 2019). Other pathogenic microorganisms like Varicella-Zoster Virus, Mycobacterium species (spp.), Pseudomonas spp., Legionella spp., and Herpes Virus, as well as multi-resistant bacteria like *Staphylococcus aureus*, are likely to add the risk on disease transmission in a dental environment (Laheij, Kistle, Belibasaki, Välimaa and de Soet, 2012).

The importance of cross-infection control measures, especially, in the dental environment has been strongly demonstrated and highlighted. This should encourage people not to be a source of infection where treatment is based on dealing with blood and saliva that could be contaminated with pathogens or using medical equipment that are not cleaned. Also, this should urge them to disinfected equipment according to universal standard precautions (Biswas, Karim, and Bhattacharjee, 2015).

Infection control is the prevention of exposure to such infections and also to prevent infection from being transferred from a person to another. The universal infection control policy states that every patient should be considered infectious (Shah and Wyne, 2010). Dental procedures sometimes become more aggressive, especially the surgical techniques and implants and dealing with sharp instruments that could be contaminated

with the saliva and blood of patients, in addition to this point, the dentist is forced to be very close to the patient and this position can cause easy transmission of respiratory diseases infections. Because of all these reasons, patient safety measures in dental clinics should be an international trend (Perea-Pérez, Santiago-Sáez, García-Marín, Labajo-González and Villa-Vigil, 2011).

Nowadays, due to the lack of patient safety knowledge among dental health providers, dental risk management becomes a major health care challenge (Cheng, Ming-Fang Yen, and Lee, 2019). Wide variation in infection control measures has been reported between developed and developing countries (Weinshel et al., 2015). In developing countries, infection control measures are either not documented, not followed, not funded by the government, or not existed, which makes the challenge of acquiring an infection during health care delivery, increasing in those countries (Vilar-Comptee, Camacho-Ortiz, and Ponce-de-León, 2017). Studies revealed that the neglection of safety measures can cause adverse events, these adverse events can lead to hospital admission (Halfon, Staines, and Burnand, 2017), increase in medical expenditure, permanent injuries, or even death (McCarthy, Tuiskula, Driscoll, and Davis, 2017). These adverse events also can expose the dentist to a legal accountability allegation in courts, scandals of press about substandard dental care, and loss of money to compensate the affected patient by court order if malpractice and substandard health care are applied. Besides that, the license of dental practice will also be at risk, while these adverse events

could be manageable and avoidable (McCarthy, Tuiskula, Driscoll and Davis, 2017). Optimally conducting delivering dental care, improvement of patient safety, and prioritizing the culture of patient safety will reduce these adverse events and enhance the positive attitude of patients toward infection control practices in dental clinics. In other words, risk management should shift from old traditional medical education to new world accountability, teamwork, and interdependency (Omidi, Akbari, Hadavandi, and Zarei, 2019).

1.2 Problem Statement

Several systematic reviews and reports were published about compliance with infection control practices in a dental environment in developed and developing countries (Vilar-Compte, Camacho-Ortiz, and Ponce-de-León, 2017; Alduais and Mogali, 2015). In Palestine, the obstacles impeding the enjoyment of the highest attainable standards of health for Palestinians living under occupation, including barriers and lack of access to adequate health care provision, access to health care, determinants of health beyond health care and health attacks (WHO, October (2019)). Furthermore, studies in Palestine implemented on infection control measures in dental clinics are very few.

We have (5) public dental clinics in each district Nablus and Tulkarm. 414 dentists have registered in PMH from Nablus versus 276 dentists from Tulkarm (Palestinian Health Information Center (PHIC) - MOH, Jul-2019). The logistic regression model showed that visiting dental

clinics and do dental procedures are considered as the most significant risk factor of acquisition of HBV infection in the north of Palestine, according to a univariate analysis done in 2014 (P-value <0.001, OR 5.6; 95% CI 2.8-11.1) (Nazzal and Sobuh, 2014). But actually, the real estimation of cross-infection and infection control measures in these clinics is not clear as well as these measures are not controlled by the (PMH). Current epidemiological data indicate that the risk of oral health care professionals contracting disease through dental treatments is minimized when recommended infection control procedures routinely are followed (Todorova, Tsankova, Kostadinova, and Lodozova, 2015). In this study, we are going to evaluate the infection control measures, and the level of compliance with standard precautions of infection control established by the Center of Disease Control and Prevention (CDC) and the Palestinian infection prevention and control in dental clinics related to Nablus and Tulkarm districts, Palestine.

1.3 Justification

In dental clinics, percutaneous exposure incidence remains the main concern for patients and dentists at the same time, which is a major source of infectious agents and virtual risk. Minimizing percutaneous exposure incidence should be seriously taken into consideration, including many ways like infection control practices, continuous education about these practices, HBV vaccination...etc. Basically, for any infection control strategies, dentists should be aware of sterilization, individual protection

measures, and a higher level of disinfection utilities (Kohn, Collins, Cleveland, Harte, and Eklund, 2003).

This study has taken place in Nablus and Tulkarm Governorates because the access was convenient due to the proximity in the distance. The study shew us by answering all parts of the questionnaire, the knowledge, attitude and compliance of dentists toward/with infection control measures in their services. In case that dental clinics have a role in the transmission of infectious diseases, then (PMH) can provide a plan for dental practitioners to follow and therefore reducing this problem. Moreover, by this study, we can refresh the mind of the dental practitioners (we have old practitioners in dentistry) and remind them of the importance of infection control measures for themselves and for their patients.

1.4 Aim of the study

To assess the level of knowledge, attitude and compliance with infection control measures in public and private dental clinics during COVID 19 Pandemic, between July and August 2020 in Nablus and Tulkarm districts, Palestine.

1.5 Study objectives

1. To assess the level of compliance with infection control measures in the dental clinic in Nablus and Tulkarm districts, Palestine concerning the Standard Precautions of Infection Control established by the CDC and the Palestinian Infection Prevention and Control Protocol that was

updated in 2010 by the Palestinian Ministry of Health using self-reporting questionnaire.

2. To assess the knowledge and attitude of dentists about (ICM) in Nablus and Tulkarm districts, Palestine.

3. To assess the differences in compliance with (ICM) according to the Gender, Education Level, and Experience characteristics of the participants (independent variables).

4. To assess the differences in compliance with the infection control practice between private, UNRWA, and governmental dental clinics in both districts.

5. To find out the opinion of dentists about how to enhance the attitude and knowledge about infection control measures between dentists.

1.6 Limitations of the study

1. The study will not include dentists who are in the clinical training stage in dental clinics.

2. Some dentists will be shy so that he/she will not answer similarly to the real practice in his or her clinic.

3. This questionnaire was distributed to dental practitioners in the period between July and August 2020 which was the period of the peak of the COVID-19 pandemic in Palestine, in which all health care institutions were closed except urgent medical procedures including dental care

procedures. So, the questionnaire was self-reporting and the author was unable to verify the authenticity of the answers, due to the inability to conduct an inspection and check-up.

1.7 Summary

This chapter gives the reader an overview of the importance of cross-infection and infection control measures in dental care practice. This chapter also clears the aim of this study and the importance of assessment of the cross-infection and infection control measures that are applied in Nablus and Tulkarm dental clinics.

Chapter Tow

Literature Review

2.1 Introduction

Dental care procedure is directly dealing with saliva and blood where many microorganisms and pathogens exist, and natural mouth flora contains a huge number of microorganisms, that is why infection control measures and protocols are very important in dental clinics. Bacteria and virus aerosol spread through the dental room during dental practice. In developing countries, cross-infection and infection control practices have not been widely documented (Vilar-Comptee, Camacho-Ortiz, and Ponce-de-León, 2017). Several factors may affect the compliance of dental practitioners with infection control measures. It could be the degree of education or knowledge (Tada, Watanabe, and Senpuku, 2015). Lack of incentives and costs (Bourgeois, Dussart, Saliasi, Laforest, Tramini and Carrouel, 2018), professional variables, socio-demographic, availability of infection control equipment, and access to this equipment (Dagher, Sfei, Abdallah and Majzoub, 2017).

The first manifestation of some infectious diseases appears as lesions in the oral cavity as TB, HIV, Syphilis, and Hepatitis (Akhtar and Rehma, 2018) and COVID 19 (Kochhar, Bhasin, Kochhar and Dadlani, 2020b). The dental practitioner should have enough knowledge about these diseases to take precautions to prevent the transmission of such diseases during dental care procedures (Hussein, 2018).

Health care workers (HCWs) especially dentists are at a high risk of infectious diseases and gaining blood-borne viruses like HIV, HBV, and HCV. Because HBV significantly transmits by blood, dentists are at a high risk to be infected by this virus more than other blood-borne viruses. The main way of acquiring this virus in dental procedures is dealing with blood and saliva, needle puncturing, or cutting with sharp instruments during the dental procedure. Blood-borne diseases and protective equipment are the most important ways to protect practitioners during dental care procedures (Yasutake et al., 2020). SARS-CoV-2 also can sustain for 15 min in the aerosol, and its viral transmission is mainly by direct mucous contact, saliva, inhalation, and ingestion (Rengo et al., 2020). According to CDC reports in 2020 about SARS-COVID-2, many factors can make this virus very dangerous in dental offices. The first one is the distance between people (mainly dentist and patient) who are in close contact (within 6 feet), the virus can spread through respiratory droplets produced when an infected person sneezes, coughs, or talks. The second factor is that the virus can persist in aerosols for several hours and on some surfaces for several days. The third factor is that the virus can spread by patients who are not showing any symptoms. The risk in a dental setting involves the use of dental and surgical instruments, such as headpieces, endodontic files, ultrasonic scalers, burs, and air-water syringes. These instruments can carry particle droplets of blood, water, microorganisms, saliva, and other debris. The masks which are worn by dentists during dental care procedures can protect mucous membranes of the nose and mouth from droplet spatter, but

they cannot provide complete protection against infectious agents from being inhaled. Unfortunately, there is no full data available for dentists to assess the risk of SARS-CoV-2 transmission during dental practice (CDC, Aug 28 (2020)). Extra recommendations were published by CDC for routine dental care to all patients, the most important one is to consider if the dental care procedures, surgeries, are non-urgent outpatient visits, and assess the patient's dental situation to determine whether the patient could be postponed in certain circumstances. The dental staff has to screen and triage when every patient enters a dental clinic for signs and symptoms of COVID-19. Dental staff should implement Source Control Measures (SCM). Those measures, including the usage of face masks (procedure masks and surgical masks) or face shield to cover a person's nose and mouth to prevent the spread of respiratory secretions when they are coughing, talking, or sneezing, these SCM are applied and recommended for everyone because of asymptomatic and pre-symptomatic transmission. Maintaining 6 feet distance between patients in the waiting room to prevent the spread of the virus. Targeted SARS-CoV-2 testing can be used for patients before a dental procedure for more risk management measured to identify those with asymptomatic or pre-symptomatic SARS-CoV-2 infection, but unfortunately, the dental staff should not forget that this test can give negative results in patients during the virus incubation period. PPE should be used by all the dental staff in the dental care setting besides all guidance of infection control that was published by the CDC (CDC, Aug 19 (2020)).

2.2 Infection Transmission Cycle

Any health care practitioner needs to understand how are infectious diseases transmitted to minimize the risk and prevent acquiring these diseases. A chain of infection is the sequence that describes how the infectious diseases are transmitted between people, the chain should complete to causing disease (Gaupp, Dinius, Drazic and Ko¨rner, 2019). This chain consists of five elements (in some books there are six elements), (Manitoba Health, Seniors and Active Living, Jun 2019):

1. Reservoir is the homeland where the agent lives, multiply and grows, it could be a human, animal, or environmental reservoir (Manitoba Health, Seniors and Active Living, Jun 2019).

2. Portal of exit is the way the pathogen and germs leave its host, for example, some blood-borne agents can leave the host and transmit to another throw cuts or needle punctures (Manitoba Health, Seniors and Active Living, Jun 2019).

3. Mode of transmission is the ways which agents follow to spread from their natural host to another, different classifications for the mode of transmission, but the most common is the direct and indirect transmission. Direct transmission occurred by kissing, sexual intercourse, and skin-skin contact. Indirect transmission needs animate intermediaries (vector), inanimate objects (vehicles), or suspended air particles (Manitoba Health, Seniors and Active Living, Jun 2019). In the

health care workplace, the contact mode of transmission is the most widespread mode of transmission. It could be indirect contact (equipment and instruments) or direct contact (hands, contaminated saliva, or infected blood) (Kohn, Collins, Cleveland, Harte and Eklund, 2003).

4. Portal of entry is the way to describe the manner how pathogen enters the new host, puncture by contaminated needles or sharp instruments, direct contact with eyes, nose or mouth, enter the body from cutting skin, breathing contaminated air all these ways are examples of the portal of entry (Manitoba Health, Seniors and Active Living, Jun 2019).

5. Host is the final element of the transmission chain, the susceptibility of the person to get pathogen depends on many factors like constitutional (generic) factors, specific immunity of this person, and nonspecific factors that affect the ability to resist pathogenicity (Manitoba Health, Seniors and Active Living, Jun 2019).

2.3 Infection Control and Prevention

To take appropriate infection control measures, enough knowledge should be provided about the portal of exit and portal of entry to all workers in the public health sector. Generally, interventions directed at some particular segments in the infection chain, these segments are:

- Eliminating pathogens at natural host or source of transmission.

- Protect the new host or portal of entry.
- Increase hosts resistance and defense (Azimi, Keshavarz, Cedeno Laurent, and Allen, 2020).

Health care workers should know that not all infectious diseases carry signs and symptoms, especially at the beginning of the infectious disease, so it’s very important to take care and use appropriate infection prevention measures and consider all dental patients as infectious patients (CDC, Sep 9 (2014)).

Again, minimum standard precautions and principles of infection prevention should be applied during every routine dental procedure regardless of the health or infectious status of the dental patient and regardless of the kind of dental procedure that should be delivered. These principles include: 1) the use of protective equipment to protect health care workers (HCW), 2) hand hygiene, 3) apply safe principles of injection practice, 4) safe dealing with contaminated instruments and surfaces during the dental care procedure, 5) cough etiquette and respiratory precautions should be applied. To promote application and adherence to these precautions, HCW especially dentists should be trained and educated about these principles and precautions continuously (Gaupp, Dinius, Drazic, and Ko¨rner, 2019).

2.4 Infection Control Protocol

Many health agencies provide dentists in the United States of America and other developed countries with guidelines to regulate infection control in dental clinics like American Dental Association (ADA) (ADA, 2020b), Institute of Health and Clinical Excellence (NICE) (National Institute for Health and Care Excellence (NIHCE), 6 Aug 2020)), Occupational Safety and Health Administration (OSHA) (Occupational Safety and Health Administration OSHA, Sep 27 (2010)). In 2003, the Center for Disease Control and Prevention (CDC) established guidelines for isolation precautions to prevent transmission of infectious agents in a healthcare setting, CDC also developed a scheme of recommendations that should be followed in any healthcare setting (Kohn, Collins, Cleveland, Harte and Eklund, 2003). These recommendations deal with administrative responsibilities, education and training, surveillance, standard precautions, hand hygiene, personal protective equipment, respiratory hygiene/cough etiquette, patient placement, patient-care equipment, and instruments/devices, care of the environment, textiles and laundry, safe injection practices and many other recommendations (World Health Organization (WHO), 2004)). In March 2016, the CDC published a new CDC summary of infection prevention measures in the dental clinic, this summary helped anyone who seeks information about infection control measures in dental practice, it provides an assessment checklist. This new summary doesn’t bring new contents (the essential recommendations of CDC about infection control measures are not changed), but it collects all

recommendations about these measures that were published by the CDC from 2003 till 2016. The new summary included: 1. a summary of basic infection prevention principles and recommendations for dental settings; 2. a checklist to help evaluate dental staff compliance with an administrative and clinical practice infection prevention recommendation; 3. key references and resources for each area of focus, including sterilization, safe injection practices and hand hygiene in dental settings (CDC, Oct 2016). The summary emphasized the importance of the presence of an infection prevention coordinator in each dental clinic, which is responsible for establishing a written infection control policy based on the new evidence-based guidance, helping to apply and address infection control policy and issues according to new resources (CDC, Oct 2016). The main principles of infection control and cross-disease transmission include standard precautions. These standard precautions should be applied for all patient care regardless of the confirmed or suspected infection status of patients in any health care centers where health care should be delivered (CDC, July (2019)). The standard precautions that were established by (CDC) are including a protocol of 1) hand hygiene, 2) respiratory hygiene and cough etiquette, 3) safe injection practices, 4) safe handling of potentially contaminated equipment, 5) personnel protective equipment (CDC, July (2019)). According to FDI (the World Dental Federation), because in the dental field, there are no clear plans and policies with structured components and concepts are available, the dentist should be aware and take responsibility toward himself. Furthermore, both the patient and the

dental staff should establish a well-structured protocol to prevent and limit cross-infection transmission in the dental clinic. The mission of FDI is to help dentists and promote oral health to everyone, support member associations, and enhance the ethics of practice. FDI established a policy statement based on the updated scientific evidence provided at the time to manage the infectious diseases that may be transmitted during dental practices. FDI also encourages all oral health care professionals to adhere to standard precautions established by the local or original authorities as appropriate. Members of the oral health care team are obligated to take precautions to protect themselves, their medical staff, and their patients against blood-borne infections. FDI also urges oral health care workers to be aware of the infection risk and to take the vaccine, according to guidelines and instructions issued by the local authorities, and to take an advantage of other vaccines as and when they become available (World Health Organization (WHO), 2004).

2.5 Palestinian infection prevention and control training protocol

The PMH had released Palestinian infection prevention and control training protocol since November 2004 and updated it in 2010. It aimed to establish the best appropriate infection control practice according to the guidelines of (CDC) and (WHO) to improve the health care system in Palestine so that to protect health care workers, clients, and the community against any risk. The main components of this protocol are; using of antiseptic agents, proper hand hygiene, physical barrier usage, wearing

gloves, safe disposal of waste materials, protection of workers and instruments (Al-Ramahi, Zaid, Hindi and N'an'a, 2018).

2.6 Standard and universal precaution for all patient care

Standard precautions are guidelines introduced by (CDC) in 1996 for Isolation Precautions in Hospitals, set by the Healthcare Infection Control Practices Advisory Committee (HICPAC). These guidelines are about minimum infection prevention practices to reduce the risk of transmission of blood-borne and other pathogens, which apply to all patient care regardless of recognized and unrecognized sources of infection in any place where the health care procedure is delivered (Yasin, Fisseha, Mekonnen and Yirdaw, 2019). Universal precautions introduced by (CDC) 1985 in response to (HIV) are a set of guidelines to prevent the transmission of blood-borne pathogens to health workers from exposure to potentially infected blood or any infectious materials (Larson, Oronsky and Varne, 2018).

The CDC combined the major guidelines of Universal Precaution and Body Substance Isolation to introduce what is now referred to as Standard Precautions. These standard guidelines and precautions apply when HCWs are at risk of potential exposure to (1) blood, (2) all body fluids (semen, vaginal secretions, saliva in dental procedure...etc.), secretions, and excretions. Vomit, tears, sweat, urine, or nasal secretions are not considered as dangerous body fluids as they can transmit contamination, because these body fluids have extremely low or non-

existent capacity to transmit hepatitis B or HIV, except it contains visible blood, (3) unfixed or non-intact skin from human (dead or living), and (4) mucous membranes. Personal Protective Equipment (PPE) and hand hygiene are considered as the first barriers to protect (HCW) from any infection transmission diseases (Grohskopf, et al., 2020).

2.7 Transmission-Based Precautions

2.7.1 Airborne Precautions

Those are precautions used and performed when there is the susceptibility of transmission of any pathogens by airborne droplet during a health care procedure for known or suspected infection patient, for example, airborne droplet nuclei, those are small-particle remnants {5 um or smaller in size} of evaporated droplets. These remnants can remain in the air for long periods of time (E.g., Severe acute respiratory syndrome, Tuberculosis, Varicella-Zoster, Smallpox, Monkeypox, Measle, Aspergillosis and Herpes Zoster) (Asadi et al., 2019).

Precautions in this situation should include many domains:

- Patient placement: Doors of the room where the health care procedure is performed must be closed at all times. No cohorting (remaining in the same room) with any patients, except those of active infection of the same pathogen can be rooming together. When a private room is not available, and rooming together (cohorting) is not preferred, consultation with infection control professionals to solve this problem is

advised before patient placement. Health care procedure should be done in a negative pressure isolation room, this room allows a minimum of 6 to 12 air changes per hour (Broussard and Kahwaji, 2020).

- PPE: masks that clean and filter at least 95% of airborne debris must be worn to cover the nose and mouth (i.e., N95 respirator) (Broussard and Kahwaji, 2020).

- Transport: if necessary, patients with such infectious diseases should transport out of their rooms wearing a surgical mask (Broussard and Kahwaji, 2020).

2.7.2 Droplet Precautions

Droplets are particles which can be sustained for a short period in the air after leaving the source. It extends for three to six feet, and it is a kind of respiratory secretions +/- 5 microns. Droplet precautions are those for any patient who is known or suspected infected with pathogens spread by droplets, (e.g., Adenovirus, Diphtheria, Haemophilus Influenza, Type B Influenza, Neisseria Meningitides and Mumps) (Baubie, Shaughnessy and Safdar, 2019).

Precautions in this situation will be the following:

- Patient Placement: as with patients who are infected with airborne pathogens, private room is preferred, but they can be placed in the same room (cohorting) with another patient having the same pathogen

infection, and no other infection. At least 3 feet away from any other person should be placed, if there is no chance of cohorting, no special air handling, and the open door is required.

- PPE: six feet away from the patient is required and wearing a surgical mask.

- Transport: a patient should wear his/her surgical mask when leaving the operation room (Broussard and Kahwaji, 2020).

2.7.3 Contact Precautions

Those precautions are for patients who are known or suspected to be infected with colonized pathogens.

In this case, transmission can be by direct or indirect contact (indirect contact is by touching any surface that was contaminated by colonized pathogen from an active infected patient) (Broussard and Kahwaji, 2020).

Precautions are described in the following sections;

- Patient placement: private room is preferred or cohoring. HCW has to consider the patient health status, and the nature of the microorganism when determining patient placement, (e.g., abscess, Adenovirus, Burkholderia Cepacia, Bronchiolitis, Clostridia Difficile Congenital Rubella, Conjunctivitis, Diphtheria, Staphylococcal Furunculosis,

Rotavirus and Hepatitis A) (Public Health Agency of Canada, Sep 2017).

- PPE: gloving, gowns, hand hygiene should be done before entering the care room, gloves and gowns should be taking off immediately after finishing the care procedure (Bleasdale et al., 2019).

- Transport: contact precautions should be maintained at all times.

- Equipment: single-patient use equipment should be used all the time, if not, all equipment should be disinfected before using it by another patient (Verbeek et al., 2019).

2.8. Conceptual Framework

2.8.1. Introduction

Dental risk management becomes a major health care challenge because of the lack of patient safety knowledge among dental health providers, (Cheng, Ming-Fang Yen, and Lee, 2019). Cross-infection and infection control measures are a very critical issue among health care providers. This study was done to evaluate the knowledge, attitudes and compliance about /with infection control measures in public and private dental clinics in Nablus and Tulkarm districts, Palestine (see figure 3.1). According to literature reviews and all models suggested by the CDC, FDI, and others, cross-infection and infection control protocol are concentrated

in two domains: Infection Control Measures (ICM) and Personal Protective Equipment (PPE).

2.8.2. Overall Compliance with Infection Control Standard

Several systematic reviews and reports were published about compliance with infection control practice in the dental environment in developed and developing countries (Alduais and Mogali, 2015). The main factors that determine the degree of compliance are the dental clinic and the characteristics of the dentist. Compliance with infection control protocol is affected by many factors as knowledge and educational background (Ndlebe et al., 2020).

2.8.3 Variables Measurement

In this study, a structured questionnaire has been composed in the Arabic language (to ensure complete understanding of the questionnaire because the sample may cover old dentists and others who have been graduated from dental schools educating in languages other than English). After the questionnaire is drafted, reviewed, and approved by an institutional review board (IRB), it was distributed via email. It covers 10 issues of the basic guidelines for infection control in dental clinics. The source of these guidelines was from the CDC and Palestinian infection and training protocols that were updated in 2010 by the Palestinian Ministry of Health to assess the dentists' knowledge, and compliance.

Three types of questions were used in this questionnaire, the first one is yes or no answers, which depended on the behavior of the participant, whether he behaves (yes), or does not behave (no), with particular questions for every domain in the questionnaire. The second type is Likert three points-scale (always do, sometimes do, never do) for particular adopted questions, to assess the knowledge and compliance of the participant during a dental procedure. The third type is an open question (in your opinion, how can we increase the awareness of dentists about infection control methods in dental clinics?).

2.8.4. Dependent Variables

All the following dependent variables were measured by the questionnaire of this study using yes or no answers to questions about actual practices during dental procedures and the three-point scale (always do, sometimes do, never do) to assess the knowledge and compliance of the participant in the dental clinic. The source of these guidelines was from the CDC and Palestinian infection and training protocols that were updated in 2010 by the Palestinian Ministry of Health, which is acceptable in all health care settings in Palestine.

The following domains were measured:

2.8.4.1 Hepatitis Vaccination:

According to a report that was published by WHO in July 2019- Viral hepatitis B and C affect (325) million people worldwide causing (1.4)

million deaths a year. It is the second infectious disease killer after tuberculosis, also (9) times more patients are infected with hepatitis virus than AIDS. In the general population, the prevalence of HBV is estimated to be at (3.5%) (WHO, Hepatitis B, 27 JUL (2020)). Some groups of people have been considered as special populations who are at risk for acquiring HBV infection. HCWs are among these groups who have a particularly high risk of an occupational hazard, and they can transmit this virus to their patients (WHO, Hepatitis C, 27 July (2020)). HCWs also have an incidence of HBV up to four-fold in the general population. They are at a high risk of acquiring this infection because of direct contact with infectious instruments and materials, especially HBV-infected saliva, blood, or other body fluids (Mahasneh, ALakhras, Khabour, and AL-Sadi, 2020). Many studies, unfortunately, have appeared that awareness and proper precautions against HBV and blood-borne infections, in general, are lacking among HCWs (AL-Ahdal, Aljehani, Ali, and Bayoum, 2019).

There are many risk factors associated with the acquisition of HBV infection among HCWs. Some studies showed a higher rate of HBV exposure in older HCWs than in younger (Muljono, Wijaya, and Sjahril, 2018). The more constant risk of sure to HBV a long lifetime, exposure-prone professions (such as gynecologists, dentists, laboratory staff), long employment in these services, explain the higher infection rates among older HCWs (Ogunremi et al., 2019).

In the recent recommendation of WHO in an updated position paper on hepatitis B vaccine-July 2017, all people with occupational exposure, including HCWs should be immunized before they are placed in their work ideally before occupational exposure (WHO, Hepatitis B, 27 JUL (2020)). Three doses of intramuscular injections are considered for HBV vaccine, second and third dose generally should be given after six months of the first one (CDC, May 2, 2016). It is suggested that the vaccine is effective when individuals produce >100mIU/mI level of antibodies to hepatitis B surface antigen (anti-HBs). After two or three months of taking the vaccine, the antibody level (anti-HBs) should be tested. Because HCWs are considered as a high-risk group for HBV infection with high occupational exposure, a single booster dose five years after completion of the vaccine course is recommended (CDC, May 2, 2016).

In a study that was done in 1991 to estimate the burden of HBV among HCWs, the OHCWs community was the highest resistance to HBV among all HCWs personal, that because of vaccination against HBV (Cottone, 1991). Given this finding and burden of HBV infection in the Middle East, Far East, Africa, and parts of South America (HBV surface antigen rates ranging between 8 and 15%), HBV vaccination among all HCWs in general and OHCWs, in particular, is the most important infection control protocol (AlDakhil, Yenugadhati, Al-Seraihi and Al-Zoughool, 2019). So, the HBV vaccine should be made mandatory for all HCWs, especially, OHCWs.

All Oral Health Care Workers (OHCWs) and their staff who are in contact with Potential Infectious Materials (PIM) or patient saliva, blood, or any other body fluids should take the hepatitis B vaccine according to the policy of the American Dental Association. According to what's mentioned above, all HCWs including dentists and dental staff should wear personal protective equipment (PPE) and take the recommended course of hepatitis B vaccine to prevent the transmission of infectious diseases (Mahasneh, ALakhras, Khabour and AL-Sadi, 2020). In Palestine, all HCW should take the vaccination against HBV as recommended by WHO (Palestinian Health Information Center (PHIC) -MOH, Jul-2019).

2.8.4.2 Personal Protective Equipment Compliance (PPE):

Compliance with cross-infection and infection control practices in dental healthcare settings can be affected by several factors such as knowledge, supplies, materials, and educational background. PPE is considered the first and most important means to stop and prevent infectious disease transmission among health workers besides hand hygiene (CDC, Aug 19, 2020). PPE is used as a means and a barrier to protect mucous membranes, skin, clothing, and airway, it includes gowns, gloves, face shield, and mask (Manitoba Health, Seniors and Active Living, Jun 2019).

1. Gloves: The OHCW who are in direct contact with patients (mainly with blood, mucus membrane, and saliva) or any other PIM should wear gloves to protect themselves from being infected with infectious

diseases that transmitted by the above-mentioned ways, and even to prevent transmission of pathogens from their hands to patients (CDC, Jul 16 (2020)). In health care procedures two types of gloves are used. The first one is non sterile gloves, which are used during general examinations and any non-surgical procedures. The second type is sterile gloves, which are used during invasive surgical procedures as flap reflection, incision or excision (Doyle and McCutcheon, 2012). All dental staff and dental practitioners should wear gloves during the dental care procedure, especially if there is a direct contact with blood, mucous membrane and saliva, gloves have to be discarded between patients and after each procedure (Kohn, Collins, Cleveland, Harte, Eklund, Malvitz, 2014).

2. Masks: The OHCWs should wear masks to protect their noses and mouths from any splattered blood or saliva during dental care procedures. Masks also protect patients from any infections that can be transmitted from mask wearers (Gordon, 2020). In a post-coronavirus world, dental practitioners return to providing care in a very critical environment, they need to understand the new protection benefits offered by current mask and respirator options. The current infection control protocol provides very little instruction to dental practitioners for post-pandemic protocols (Gordon, 2020).

3. Eye Protection: Physical injury and pathological contamination of the eyes could be prevented by wearing eye protection. The OHCWs and

their assistants should wear eye protection to protect their eyes from splattered blood, saliva, or any debris during dental procedures (Kohn, Collins, Cleveland, Harte, and Eklund, 2003).

4. Protective Clothing and Footwear: The OHCWs should wear protective clothing and footwear to protect themselves from any splattered blood, saliva, or debris that could be generated during dental procedures. Footwear can protect dental practitioners and their staff from any possible injury during the dental care procedure (Kohn, Collins, Cleveland, Harte, and Eklund, 2003).

2.8.4.3 Washing Hands:

According to WHO hand hygiene is now conceded as one of the most important and the least expensive roles of infection control measures (Pfäfflin et al., 2017). Enough scientific evidence suggested that proper compliance with hand hygiene reduces the risk of acquiring pathogens in healthcare facilities (Gold, Mirza, and Avva, 2020).

Hand washing should be performed after touching an object which is likely to be contaminated with saliva, mucus, blood, or other PIM before and after dealing with any patient. Also, before and after gloving or if the solidity of the glove is compromised (Siege, Rhinehart, Jackson and Chiarello, 2007).

2.8.4.4 Instruments Sterilization:

Contaminated instruments should be handled carefully to minimize undesirable percutaneous injury (Laneve, Raddato, Dioguardi, Gioia, Troiano, and Muzio, 2019). Any usable instrument must be cleaned completely before sterilization (Siege, Rhinehart, Jackson, and Chiarello, 2007).

The method of choice for sterilizing dental instruments is autoclaving or steam sterilization. Autoclaving is done by putting instruments under the temperature of 134 – 137 °C and continued for 20 minutes (CDC, September 18 (2016a)). Dry heating is considered as another type of dental instrument sterilization, in which very high temperature is concentrated on instruments. This method is used when autoclaving is not suitable for any dental instrument (Rani and Pradeep, 2016). This method requires a longer operating time compared with steam sterilization. Autoclaving is considered the most widely used, economical, and reliable method for dental instruments sterilization (Laneve, Raddato, Dioguardi, Gioia, Troiano, and Muzio, 2019). To sterilize carbon steel instruments (e.g, Burs), the unsaturated chemical vapor method is used. In this method, a low level of water is used (so it causes less corrosion of these instruments), besides heating of a chemical solution in a closed pressurized chamber (Venkatasubramanian and Bhatnagar, 2010; CDC, September 18 (2016a)).

Immersion of dental instruments in chemical germicides or using surface disinfectants as methods of dental instrument sterilization are unacceptable (CDC, September 18 (2016d)).

Preparing instruments for sterilization:

Cleaning correctly is the first essential step in preparing instruments for sterilization. Cleaning means removing the small debris that adheres to instruments that could interfere with sterilization and then prevent the proper sterilization cycle. Instrument preparation includes five important sequential steps: chairside and transport, instruments presoaking, cleaning, corrosion control/ drying/ lubrication, and packaging (Jorgensen and John Palenik, 2004).

Chairside and transport

Next Operatory preparation for another patient cannot begin before all contaminated items and instruments are safely removed, rejected, or processed. The removal and processing of contaminated patient care instruments from the operator site should be performed carefully to prevent exposure to infectious pathogens. Contact with non-intact skin of the patient, mucous membranes, and percutaneous sharps injuries from sharp instruments provide the risk of infectious disease transmission to HCW. Instruments are then transported to the instrument-processing area carefully for the instrument containment procedure (Rijal, 2019).

Containment procedure is the procedure in which dental care instruments are cleaned, sterilized, and stored before using them in another health care operation for another patient. Sharp instruments should not be carried openly to the instrument-processing area to prevent percutaneous sharps injuries for HCW (CDC, September 18 (2016a)).

Instruments pre-soaking

This step includes the pre-cleaning process for instruments before the instrument-processing procedure began, instrument pre-soaking starts immediately after transporting the dental care instruments to the instrument-processing area. In this stage, the instruments are placed into a holding solution in a puncture-resistant container to enhance the cleaning process by preventing remnant debris from drying on the instruments. Then Cleaning becomes easier and takes less time. This holding solution can be an enzymatic cleaner, disinfectant, or detergent. High-level sterilant and disinfectant (e.g., Glutaraldehyde) are not considered an appropriate holding solution, therefore, they are not recommended. The person who is responsible for cleaning and sterilization should follow the recommendations made by the cassette manufacturer because some plastic/resin cassettes should not be placed into a holding solution. Also, some instruments may corrode if they are left in the holding solution for more than a few hours. (CDC, September 18 (2016b)).

Cleaning

Instrument cleaning is an essential step before any sterilization procedures. Cleaning removes any remaining blood, microorganisms, saliva, dental materials, and debris or oral hard tissues. Two types of cleaning dental instruments are generally used: mechanically (ultrasonic cleaning, instrument washers) (CDC, September 18 (2016b)).

- Ultrasonic cleaning: This way has a major advantage over the manual way. 1) it decreases the chances of cuts, wounds, and punctures when cleaning sharp instruments, 2) it is more efficient and effective than the manual way, 3) HCW can clean more instruments in a given period, and 4) all instruments (loose instruments and those held in cassettes) can be cleaned with ultrasound method except for dental hand pieces which should be cleaned manually (Vavrosky, 2017).

- Instrument washer: or washer-disinfector. This device has been used in hospitals and larger clinics. It is available in dental offices. This unit (cleans instruments) uses a high temperature for disinfection then is followed by high-pressure spray rinses, this machine is recommended by CDC (O'Connor and Armstrong, 2014).

Manual cleaning is followed to clean some instruments properly in cases of very adherent debris. This method sometimes is considered a dangerous method because of increasing the chances of occupational sharp injury. Mechanical cleaners are very efficient, because of no need to clean

instruments manually before placement in an ultrasonic cleaner or instrument washer (National Distribution and Contracting, Inc, 2011).

Control, Drying, and Lubrication

Instruments should be rinsed well after cleaning, then dried completely if hand drying is used for instruments. The HCW should be careful in order not to injure the users. Some instruments (e.g., hinged types) may require lubrication in order to function properly. PPE should be used because sterilization is not done yet. Some dental instruments can be damaged (rusting and dulling) by steam autoclave, those contain carbon steel. Carbon steel is common in cutting/scraping edges of some dental instruments (e.g., orthodontic pliers, hatchets, and scalars), dental burs, and grasping surfaces of forceps (O'Connor and Armstrong, 2014).

Some kind of solutions that contains sodium nitrate called rust-inhibiting solutions can be sprayed on such instruments which were damaged in a steam autoclave prior to processing (O'Connor and Armstrong, 2014).

Packaging

Packaging the instruments before sterilization will help keep them from being infected or contaminated during the storage or transportation for another patient's use. Unpackaged instruments have no practical uncontaminated shelf-life. Furthermore, instruments processed without

proper protective packaging can be readily contaminated after a short time of processing (CDC, Feb 16 (2016); OR Manager, 2016).

Sterilization of Hand pieces, Prostheses, and Orthodontic Instruments:

The Centers for Disease Control and Prevention (CDC) classify patient-care instruments and items into three categories critical, semi-critical, or noncritical, this classification is based on the potential risk of infection during patient care procedure and instruments used (CDC, September 18 (2016c)). Essentially, critical items (e.g., surgical instruments, needles, rasps, blades, burrs) are defined as those instruments that penetrate inside soft tissue, contact the bloodstream, touch any sterile tissue in the oral cavity, and contact bone. Semi-critical items, those which contact and touch mucous membranes or non-intact skin, but those instruments do not penetrate inside soft tissues and do not contact bone, or enter into the bloodstream because those are not sharp enough to do that, also those instruments do not normally enter into sterile tissue of the oral cavity; these instruments include mouth mirrors, reusable dental impression trays amalgam condensers, prosthodontics items as dentures and partial dentures and finally dental hand pieces. Lastly, noncritical items such as radiograph heads/cones, lead x-ray aprons, blood pressure cuffs, stethoscopes, pulse oximeters, and face bows are those that contact intact skin (Manitoba Health, Seniors and Active Living, Jun 2019). It is noticed that most of the items and instruments used in orthodontic and Prosthodontic treatment are within the semi-critical category, according to

Spaulding's classification (Wright, 2019). Some instruments may become contaminated during patient care procedure use, either through handling with HCWs gloved hands or contacting with orthodontic items that have been in the patient's mouth and then manipulated or adjusted in the laboratory outside the mouth. Steam sterilization or dry-heat sterilizers should be used to sterilize orthodontic and Prosthodontic instruments, but dry- heat sterilization has prolonged cycles and reaches enough high temperatures to damage some instruments. In any method of sterilization, instruments should be packaged before sterilization and remain in their intact package during storage (OR Manager, 2016). FDA identified some dental instruments as single-use devices (SUDs) like dental burrs, plastic, and metal orthodontic brackets, and diamond burrs (Manitoba Health, Seniors and Active Living, Jun 2019).

Unfortunately, most responders did not sterilize hand pieces after each procedure, they satisfied cleaning them with alcohol only. Autoclaving hand pieces is the strongly recommended method for sterilization. Cleaning dental hand pieces with disinfectant or immersing them in chemical germicides is considered unacceptable methods (Sasaki and Imazato, 2019).

a. Monitoring of Sterilization

Mechanical, chemical, and biological indicators are used to evaluate the effectiveness of sterilization procedures in dental clinics (Jane, 2017).

- Mechanical Indicator, usually is used to evaluate the temperature, time, and pressure of every sterilization cycle by monitoring the criterion of the sterilizer (Schrubbe, 2018).

- Chemical Indicators: In chemical indicators, sensitive chemicals are used to evaluate the physical conditions of the sterilization process (e.g. , , time and temperature) during each cycle. When the sterilization cycle reaches the proven parameters, the color of the chemical indicator changes, but this change does not ensure sterilization process effectiveness, it is used to monitor any errors that may occur during the sterilization cycle. Two types of chemical indicators are recommended; internal and external chemical indicators. In the internal chemical indicator, one can sure that the sterilization agent penetrates the covering material and reaches all the instruments (OSHA Review- Feb. 15, 2017). On the opposite, external chemical indicators are located outside the instrument covering material and are used to clarify that the packaging has been processed through a sterilization cycle (Uguzzoni, 2020).

- Biological indicator, which the killing of some known very high resistant microorganisms is being assessed, it differs from chemical and mechanical indicators in which they assess physical and chemical situation required for the sterilization process, that is why Biological Indicator (BI) is conceded as the most reliable method for monitoring the sterilization process (STERIS Healthcare, 2020). (BI) should be

used at least once weekly to verify the function of any sterilizer (OSHA Review- Feb. 15, 2017).

Disinfection is the procedure of destroying pathogens and other harmful microorganisms on instruments or any objective by physical or chemical means. Disinfection does not assure sterilization; therefore, it is not recommended if sterilization methods are possible (AL-Ahdal, Aljehani, Ali, and Bayoum, 2019).

b. Storage of sterilized materials

The units should be stored in a clean, dry, and closed locker after the sterilization cycle has been completed and the sterilized instruments are dried and cooled. The wrapped sterilized instruments remain sterile indefinitely unless an event causes a package to become contaminated (e.g., torn, wet or open packaging). Prior to the use of the sterile instrument, the HCW should inspect to verify dryness and barrier integrity. When the packaging is recognized (i.e., torn, wet, or open), the instruments before a new use should be re-cleaned, re-packaged in a new wrap, and re-sterilized again. The date of sterilization is usually noted on the outside of the packaging material (Elsenpeter, 2019).

2.8.4.5 Decontamination and Cleaning

There are two types of environmental surfaces in the dental environment. The first one is housekeeping surfaces (floor, benches, walls), the second one is clinical contact surfaces (dental chair unit, composite

light cure, light handles). These surfaces have an indirect role in bacterial transmission via hand contact. Hand hygiene has a very important role in stopping cross-infection transmission in this way. Surfaces which are difficult to be cleaned and disinfected must be covered with disposable protective barriers, this is the second method of disinfection for surfaces (DePaola and Gran, 2019), especially the clinical contact surfaces which are directly contacted with patients. Covering barriers have to be changed after finishing each dental procedure. (Scotland Dental Clinical Effectiveness Programm, Jan 2016).

2.8.4.6. Medical Waste Management and Environmental Infection Control

Dental clinic activities like other health care institutions produce various types of waste that play a role in harming the environment as well as humans everywhere. Waste management and environmental infection control could stop these series of harming and keep our communities and environment green and peaceful (Agarwal et al., 2012).

In the dental clinic, mercury, silver, lead, blood, sharps, and chemicals should be managed as hazardous waste to protect the environment from environmental disaster (Agarwal et al., 2012).

Dental Staff who is handling these dangerous materials should be trained on the Workplace Hazardous Materials Information System

(WHMIS) (Government of Canada, Employee Assistance Services (EAS), 2020).

Mercury, lead aprons and lead foil should be disposed of by contacting Certified Biomedical Waste Carrier (CWC) (Dhar and Sridharan, 2018).

Silver-containing waste should not be rinsed down the drain, recovery unit should be used to de-silvering, then it can be mixed with water and developer and finally disposed of down the sewer or septic system (Hasan, Saeed, and Priyadarshini, 2015).

Blood should be put in a yellow biomedical waste bag covered with a double bag, labeled with a Biohazard symbol, and handed over by (CWC) (Celiton, 2019). Sharp instruments (Needles, scalpels, acid etch tips glass carpels, burs, files, blades, and other sharp objects) should be collected in a red or yellow puncture-resistant container with a firm lid, and once full, the (CWC) should be contacted for disposal (Celiton, 2019).

For chemical sterilants, non-chlorinated plastic containers should be used to minimize environmental placed and impacts in the solid waste stream. Ignitable sterilants should not be poured down the drain as they can explode. Formaldehyde (HCHO) sterilants should also not be disposed of down a drain. Dental staff should not pour sterilants into a septic system because this will disrupt the bacteria that normally breakdown wastes (Nova Scotia Dental Association, Spring 2018).

2.8.4.7 Rubber Dam

A rubber dam is a tool for tooth isolation during dental treatment care in dentistry. This tool has an important role in cross-infection and infection control for both patients and dental practitioners (Al-Amad et al., 2016). Some communicable diseases such as AIDS and Hepatitis virus transmitted by body fluids. So, the dentist and dental staff can protect themselves against infection that can be transmitted by the patient's saliva (Al-Amad et al., 2016).

2.8.4.8 High Volume Evacuator (HVE)

Water spray and air turbine handpieces can generate aerosols that may contain a large number of microorganisms and remain airborne for a long time (Sawhney et al., 2015). Accidental inhalation of aerosol and splatter composed of blood, saliva, and tissue fluid which may contain a large volume of bacteria and other pathogens, can cause blood-born infections. COVID-19, Hepatitis-B, Tuberculosis, Severe Acute Respiratory Syndrome (SARS), and AIDS are examples of such infectious diseases that are transmitted by accidental inhalation of infected splatter and aerosol (Ather et al., 2020).

A High-Volume Evacuator (HVE) is a suction device that can suck a large volume of air and fluids (e.g., saliva and water). The device can remove a volume of air up to 100 cubic feet per minute. HVE may address aerosol reduction during dental procedures (Avasthi, 2018). Some

researchers illustrated promising results when using HVEs during dental procedures causing a 90% to 98% reduction of aerosols (Avasthi, 2018).

2.8.4.9. Protective Mouth Rinse

Aerosol and splatter that generate during dental procedures, can carry a large number of pathogens, saliva, and blood. Accidental inhalation of this aerosol by dental practitioners can cause blood-borne infectious diseases. Pre-procedural mouth rinses with 0.2% chlorhexidine before the dental treatment has been approved in controlling aerosol and splatter production (Hendrick, 2020).

2.8.4.10. Having A Protocol for Dealing with Sharp Instruments

Contaminated Needle Stick and sharp Injuries (NSIs) can be considered as the most common sources of infection among OHCWs (Mukram, Ashok, Prasant, and Safiya, 2020). It has been noted that about 3 out of 35 million HCWs in the world experience Needle Stick Injuries (NSIs), or other sharp instruments injuries annually, exposing them to blood-borne diseases (Joukar et al., 2018). HIV, HBV, and HCV are the most common blood-borne infectious pathogens transmitted by NSIs, besides another 20 different pathogens that could be transmitted post-injury (Garus-Pakowska and Górajski, 2019). As the dental treatment procedure requires daily use of injections with sharp instruments and dealing with blood and saliva, the risk of NSIs is consistently very high among OHCWs

who exhibited poor compliance to cross-infection and infection control protocols (Garus-Pakowska and Górajski, 2019).

Safe work practice should be followed by the HCWs during dealing with sharp instruments and needles according to the CDC. Most of the needle injures can be eliminated if unnecessary needle usage was stopped, or if a safer needle device was used. Small sharp instrument injuries occurred because safety measures were not followed, improperly followed, or sharps are not disposed of properly. Many sharp instrument injuries were classified as “non-preventable” accidents when the patient moved suddenly during procedures requiring a needle injection. Altering and preparing the patient before the procedure begins may prevent some of these accident injuries (Joukar et al., 2018).

The CDC stated a protocol that has to be done after exposure to sharp instruments or needle injuries. This protocol includes many steps beginning with stopping the procedure, washing the affected area immediately with soap or disinfectant and water, using sterile water in case of exposure of mucous membrane (e.g. , , the eye), assessing the depth of injury, then checking the instrument wither it was contaminated with blood or any body fluids, assessing the risk factors for the patient and the immunity status of the dentist for HBV and finally, taking of prophylaxis in the case of exposure to HBV, HIV and HCV (Abubaka et al., 2018).

2.8.4.11. Having a puncture-resistant container for sharp instruments

Disposable needles, scalpels, or any other disposal sharp instruments should be got rid of into puncture-resistant containers before disposal. Solid waste contaminated with saliva, blood, or any other body fluids must be placed in sturdy, sealed impervious bags to prevent leakage of the contained fluids. All contained solid waste and puncture-resistant containers must then be disposed of according to requirements established by local, federal, or state environmental regulatory agencies and legal published recommendations (U.S Food and Drugs, 2018).

2.8.5 Independent Variables

Independent variables are factors and conditions affecting dependent variables. The researchers measure the effect of those factors, to illustrate their relationship with a studied phenomenon. This study displayed the relationship between independent variables and attitudes of practitioners in applying cross-infection and infection control measures.

The followings are some independent variables that have been used:

- Gender, whether the responder is male or female.
- Ownership refers to whether the placement of dental care is public (governmental), UN clinics, or private.
- Years of experience refer to the number of years spent in dental care within five categories (≤5, 6-10, 11-15, 16- 20, >20).

- The Governorate refers to whether the dentist is from Tulkarm or Nablus district.

- Educational Level refers to whether the practitioner is a general practitioner or specialist.

- Source of information's about cross-infection and infection control refers to where does the dentist knows about infection control measures from. The dentist can choose one of five options (schools of dentistry, scientific meetings, and training, high schools, dental journals, or other resources).

2.9 Globally

A study that was made in Spain (2011) by the School of Medicine, Universidad Complutense de Madrid in the title of "Patient Safety in Dentistry: Dental Care Risk Management Plan," has discussed a seven-step plan that covers the main objectives of patient safety in a dental practice. The patient is not aware of any adverse events. The great differences in dental practices make collecting data very difficult, many dental clinics are considered as a private sector so reports about any adverse events will cost a lot of money that is why these reports are rare and no generalized culture deals with patient safety. These factors cause a delay in risk management and patient safety studies in the dental environment. The mentioned study suggests that in order to implement risk management tools in dental clinics throughout Spain, the seven-step plan can cover the main objectives of

patient safety in the dental environment. These basic concepts are (Perea-Pérez et al., 2011):

- Definitions: in order to understand the main issues that the dentist should take care of, he should distinguish between some definitions like, patient safety, risk management, adverse events, errors, near misses, accidents, and negligence.

- Professional errors in dentistry: those are errors in medicine, which are extensive, as adverse drug events, medication errors, errors in intensive, and prescription errors. These errors cause harm to patients.

- Oral surgery and patient safety: the surgical complications occurring in industrialized nations shows that the per operator death rate lies between 0.4-0.8%, while the rate of major complications is from 3-17%. In these nations, half of the dental adverse events are related to dental surgery, so half of these are avoidable (MatsudaI, Grinbaum, and Davidowicz, 2011; Bernardo Perea-Pérez et al., 2011).

In 2007 the “World Alliance for Patient Safety” established the “Global Patient Safety Challenge: Safe Surgery Saves Lives” this was the second objective. This objective is dealing with the main four areas: preventing infection of the surgical wound, safe anesthesia, safe surgical equipment, and the measurement of surgical services. In 2008 the “World Alliance for Patient Safety” provided the “Surgical Safety Checklist” this checklist is considered as the first reference to keep patients and surgeons

safe (Bernardo Perea-Pérez et al., 2011; World Alliance for Patient Safety, 2008).

Another study was conducted in the USA in 2009, on dental students and dental practitioners to assess the attitude, knowledge, and practice of wearing gloves as barrier protection before doing dental treatment in dental clinics. The study concluded that dental students, as well as practitioners, have to be educated about infection control guidelines (Kanjirath, Coplen, Chapman, Peters, and Inglehart, 2009).

In the purpose of assessing the knowledge, attitude, and implementation of hand –hygiene practice and factors associated with skin health among general dentists in the UK (2008), a study had come up that most general practitioners use soap and water for hand hygiene, few use alcohol-based hand sanitizers for hand hygiene. So, more education about CDC hand hygiene guidelines, implementation of these guidelines, and measures of skin health have to be improved among general dental practitioners (Myers et al., 2008).

In the same field, a study was done in 1998 in the Province of Bari in Italy among 200 dentists out of 358 reported in the list of the dentists to assess the disinfection practice and sterilization in dental clinics in this Province. The study concluded that the dentists underestimated the way of transmission of some microorganisms because they consider the risk of infection with contaminated aerosol is unlikely. Training and more education are very important to increase knowledge and improve infection

control practice among dentists (Lablaco, Larocca, Germinario, Chirona and Quarto, 1998).

A cross-sectional study (2014) was conducted in Dhaka city in Bangladesh to assess the level of infection control measures and protocol among the middle age group of dentists. The study revealed that the Ministry of Health has to provide more formal courses and training programs about infection control measures for dental practitioners of all categories. Also, dental practitioners must update their knowledge about infection control measures to improve their knowledge and information about these measures. Training courses are important before issuing a license for dental practice, immunization, and implementation of infection control measures, all these aspects should be taken into consideration (Ahmed, Barua, Imtiaz, and Eusufzal, 2014).

A study on Turkish dental practitioners to investigate education, knowledge, and implementation of infection control among dentists has been applied in Samsun City (2009), the study showed that (95.60%) of participants consider all patients as infectious and all infection control measures have to be applied on them. The study also revealed that dentists had moderate knowledge about infection control measures. The author recommended that educational courses and training programs have to be followed to improve knowledge and attitude of infection control measures among dentists who are evaluated in this study (Yüzbasioglu, Saraç, Canbaz, Saraç and Cengiz, 2009).

To assess the precautions followed regard droplets and airborne infections, a study among faculty members and undergraduate students in Udaipur and Rajasthan in India has been issued in 2010. The study showed that despite the fairly good knowledge among dental practitioners about infection control measures, the compliance with these measures was very low, more educational programs have to be implemented in order to improve the practice level and reduce the risk of infection transmission (Jain et al., 2010).

Another study in India was carried out in 2012 to identify the infection control guidelines and assess the knowledge, attitude and practice among dentists in private clinics and hospitals regard biomedical hazardous waste management. The study pointed out that dental practitioners need more training programs about biomedical waste management and infection control guidelines. The importance of cooperation between hospitals and private dental clinics and pollution control boards to ensure the proper management and handling of biomedical waste have been recommended (Agarwal et al., 2012).

In San Paulo (2009), a study was conducted between March and April among dental surgeons to assess the implementation of infection control measures during their surgical practice because patients and surgeons are highly exposed to infection transmission risk in the dental environment. The authors observed that the dental surgeon didn’t use protective barriers on the surfaces, also used non-recommended methods of

disinfection, sterilized with an ineffective method, and failure to monitor autoclaves. So, all these observations need to be improved by regular and updated courses according to the authors recommendations (Matsuda, Grinbaum and Davidowicz, 2011).

2.10 Regionally

In the Arab world, studies about infection control measures in dental clinics are also very few as in all worlds (Tada, Watanabe, and Senpuku, 2014; Alshatrat, Shuman, Darby and Jeng, 2013). A study that was done in Lebanon (2015) in the title of "infection control measures in private dental clinics in Lebanon," to measure the compliance of private clinics dentists towards infection control. A survey, including 46 questions related to safety procedures regarding the main 9 issues about patient safety according to CDC. The questionnaire was sent to 1150 Lebanese dentists. The sample was selected from the database of registered dentists based on a proportional random sampling. The study concluded inadequate compliance with infection control measures in private Lebanese dental clinics. Also, the study recommended improving educational training and sustained monitoring by regulatory bodies (Dagher, Sfei, Abdallah, and Majzoub, 2017).

In Jordan, a cross-sectional study was made in 2005 to assess the compliance of dentists in the private sector in North Jordan with infection control measures. The results indicated that 13% of dentists fully complied with all list of infection control precautions, young females were more

compliant than males. The study recommended mandatory education of infection control measures, and continuous visits by the health and safety committee to dental clinics to assess the application of infection control measures (Al-Omari and Al-Dwairi, 2005).

In Saudi Arabia, a cross-sectional survey was applied among private dental clinics in Riyadh (2002) to assess the application of infection control guidelines in these clinics. The study revealed that dentists had no enough and appropriate knowledge about infection control measures and set recommendations to do health education courses among dentists concerning infection control practice, besides developing a manual about infection control measures for dental practice (Al-Rabeah and Moamed, 2002).

2.11 Nationally

In Palestine, a study was conducted in Hebron by Hroub (2016) in the title of “Assessment of the Infection Control System in Dental Clinics in Hebron District.” Hroub’s study assessed the compliance of dentists with the application of the infection control system guidelines. Information was collected by using a self-administered questionnaire distributed to 116 dentists, 7 were from the public sector and 109 were from the private clinics. The response for this study was 100% from the public sector and 93.6% from the private sector. The study used many characteristics variables, including gender, age, level of education, years of experience, working hours per week, and ownership variable. The study made a

comparison between these variables in applying the guidelines of infection control measures and compliance with it. The guidelines according to CDC were; hand washing protocol, attitude toward personal protective equipment, decontamination and cleaning, and immunization against HBV. The results revealed that knowledge and attitude toward infection control practices were (65.82%), and the compliance with these guidelines was (44.0595%). According to the study results, the knowledge, attitude, and practice of infection control measures in Hebron district were proved to be weak, and the dentists need to improve their image about infection control measures (Hroub, 2017).

In 2014, a study was done by (Kateeb et al.) about the willingness of Palestinian dentists to treat patients with blood borne diseases (especially HIV and HBV diseases) using simulated patients asking for taking appointments in dental clinics. Four students at Al Quds University School of Dental Medicine made a phone call for 400 dentists registered in the Palestinian dental association as a random sample to take appointments for dental treatment as they are patients. The response rate to the telephone survey was (76%), of these dentists (66%) accepted to take an appointment for these simulated patients, and (34%) refused to give an appointment. Appointments of HIV disease were refused by (68%), and those of HBV were refused with (32%). This means that one-third of dentists refused to treat patients with blood-borne diseases, and about two-thirds of dentists refused to treat patients with HIV disease. The authors focused on the following points: (1) many dentists are still holding unfounded, negative

attitudes toward patients with blood-borne diseases. (2) Patients infected with HIV or HBV are having difficulty in obtaining dental health care in the Palestinian territories. And (3) there is a lack of confidence among dentists in their ability or their practices and readiness to treat such patients. The mentioned study highlighted the need for educational programs and clearer professional guidelines to improve attitudes of dentists, especially, female dentists, old dentists, and dentists practicing in northern Governorates towards patients with blood-borne diseases (Kateeb, Amer, and Bajali, 2014).

Another study was done to evaluate the implementation of safety measures regarding dental waste management when getting rid of hazardous waste produced by dental clinics in Nablus district, Palestine in 2004. Amalgam filling with its mercury component used in dental treatment is considered the most problematic hazardous waste. The study revealed that all waste in dental clinics (including medical waste) was mixed during collection and disposal, there was no correct separation between dental wastes as classification published by WHO, the waste finally was put in open dumping sites near the communities. Finally, the study recommended cooperation between the government, related authorities, and dental associations to improve dental waste management (Mosleh, 2004).

The dilemma of the current study is lying about the evaluation of infection control measures in dental clinics in Nablus and Tulkarm districts, Palestine. The PMH stresses laws about the application of infection control measures in dental clinics. They conduct an audit on all dental clinics using a checklist of conditions that must be met in each clinic as a prerequisite for granting the license [see appendix 1]. In 2018, the department of oral and dental health in PMH distributed a sample of a protocol about cross-infection and infection control measures to be followed by dentists [see appendix 2and 3].

Unfortunately, there is no real estimation about the application of this protocol because there are no control and monitor on these clinics.

Chapter Three

Methodology

3.1 Introduction

This chapter discusses the main steps for this study beginning with sample setting, recruitment of study participants, calculation of the number of the study population, study design, and study tools. A pilot study was done before beginning the study to ensure that the questions were clearly articulated, and the response options were relevant. Statistical analysis and ethical considerations have been documented.

3.2. Sample Setting

The questionnaire has been sent via email to 265 dentists in Nablus and Tulkarm districts, Palestine between July 2020 and August 2020. Participants who did not respond to the first mailing reminded 3 weeks later through an emailed memo. All questionnaires have been forwarded with a cover letter explaining the goals of the study. This paper included a consent form as if the dentist accepts to participate in the study, he/she sent it again with answers [see appendix 4].

3.3 Recruitment of study participants

In this study, a universal sample of dentists who were registered in the Palestinian dental association to practice dentistry in Nablus and Tulkarm districts have been recruited. The sample size was estimated at a

95% confidence interval (C.I) accepting a margin of error of 5% using the sample size calculator (www.raosoft.com) for a population of nearly 690 dentists practicing in Nablus and Tulkarm districts (Palestinian Health Information Center (PHIC) -MOH, Jul-2019). A sample size of 269 dentists from 276 from Tulkarm has been selected, (because 5 dentists work in public dental clinics, and 2 dentists work in UNRWA have been excluded) who are registered in the Palestinian Dental Association. In addition to 406 dentists, 414 were from Nablus (5 dentists work in public dental clinics and 3 in UNRWA have been excluded). After the exclusion of dentists who work in public clinics and UNRWA, the rest participants 675 dentists have been selected based on a proportional stratified random sampling to ensure equitable representation of Nablus and Tulkarm districts in Palestine. Participation of the dentists has been drowned from two Governorates and professional contexts, regardless of age, gender, educational level, and years of practice, the objectives of the study had been accomplished to be representative and generalized. When a dentist declines to participate in a study, he/she has been substituted by the following dentist on the list. The total number of the study population was 675 dentists. The study targeted a sample of 245 dentists, and therefore the ratio of the study sample to the total study population was 245/675=0.362 dentists. Based on the foregoing, the sample that has been taken from each Governorate was according to the following formula: the number of dentists in the Governorate×0.362. After the sample size was determined the questionnaire was distributed between July and August which was the

peak of COVID-19 in Palestine, and the participants were not at their working places. The accompanying table shows the target sample in each Governorate was based on the previous equations.

Table 3.1. Target Sample in Each Governorate

Sample size	A population study in Governorate	District
147 dentists	Nablus (406) dentist (after we exclude 5 dentists who work in public and 3 UNRWA dental clinics)	1
98 dentists	Tulkarm (269) dentist (after we exclude 5 dentists who work in public and 2 UNRWA dental clinics**)**	2

3.4. Study design

A descriptive, quantitative, and cross-sectional design was adopted in order to assess the level of knowledge, attitude and compliance about /with infection control measures in dental clinics in Nablus and Tulkarm District. Data was collected between July and August of 2020. 265 self-reported questionnaires were distributed to 265 dentists working in public, private, and ANRWA clinics regardless of age, gender, and years of practice.

3.5 Study tools and variables

This study covered 10 issues of the basic guidelines for infection control in dental clinics according to CDC and Palestinian infection and training protocols that were updated in 2010 by the Palestinian Ministry of Health to assess the dentists' Knowledge, attitudes and compliances of the basic guidelines of infection control in dental clinics. A questionnaire comprising 63 questions will be structured and designed in the Arabic

language (to ensure complete understanding of the questionnaire because the sample may contain old age dentists and others who graduated from dental schools educating in languages other than English), see appendix (4,5). The first part of the questionnaire asks about the demographic profile, which includes details regarding age, gender, the region of work, and level of education. Then each participant has answered a series of questions about the infection control measures that they have been done regularly during clinical practice. The main variables that have been analyzed during this study were the infection control measurements using in dental clinics, knowledge, attitude and compliances about/with these measures, general guidelines for self-protection, vaccinations of dentists. Also, the history has been taken from the patients and what should be done if an accident happens during the procedure. These variables as per the following sections;

(i) Section 1. It covers general information related to gender and type of practice (i.e., general versus specialty practice, years of experience, and main region of practice).

(ii) Section 2 and 3. Cover the knowledge and attitudes related to the sources of infection control knowledge, infectious diseases and transmission of infection, the record of the patient's medical history, and dentist and staff HBV immunization.

(iii) Section 4. Covers hand hygiene (with 4 questions related to the frequency of handwashing) and personal protective equipment covering the

use of gloves, protective eyewear, a mask, a head cover, disposable items, and gowns.

(iv) Section 5. Covers the control of aerosol usage of rubber dam, high volume evacuator, and preoperative mouth rinses.

(v) Section 6. Is about occupational accidents (sharp injuries record and treatment protocol), disposal of sharp instruments, and medical waste management.

(vi) Section 7. Is addressing cleaning, disinfection, and sterilization of instruments, burs, and hand pieces, efficiency examination of the autoclave, and methods used for that.

(vii) Section 8. Covers surface barriers and surface disinfection (computer, keyboard, curing light source, and dental unit surfaces).

(viii) Section 9. Includes a short-written question about the opinion of the dentist on how to increase the awareness of dentists in infection control measures.

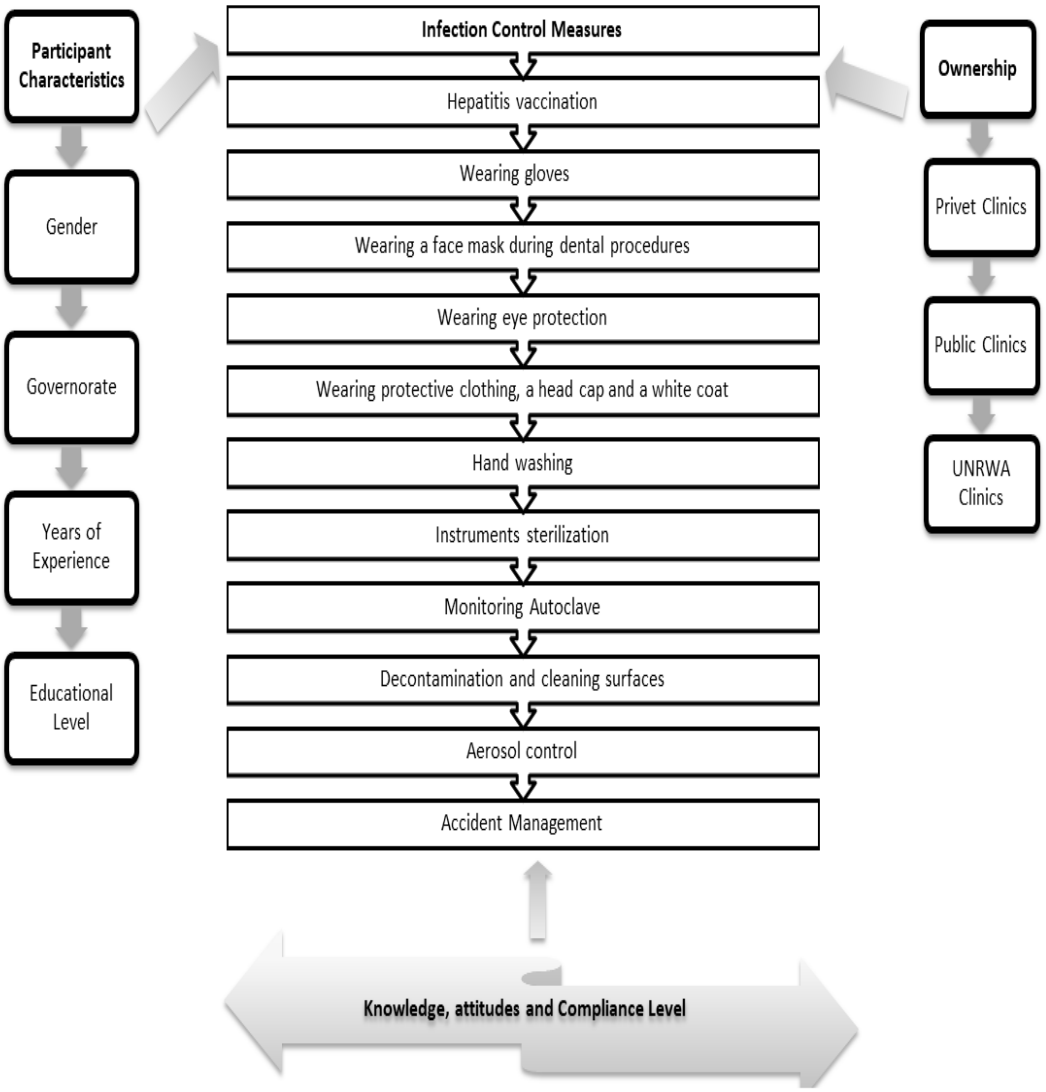

Figure 3.1: Conceptual Framework Model of the Study

3.6 Pilot Study

To test the suitability of the current study method, a pilot study was carried out on a random sample of 20 dentists from the Jenin district after permission was obtained. Information about the study and its objectives was provided to the voluntary participating dentists, then a consent form was signed. As a result of the pilot study, the questionnaire was clear and easy to understand, it also gave a good interpretation of the data and

minimum participant errors, besides the evaluation of knowledge and compliance with (ICM) of participating dentists.

3.7 Statistical Analysis

Any questionnaire with less than 90% of completed answers has been excluded. Initially, MS excel has been utilized for coding the data obtained through the questionnaire and resulting answers have been recorded and processed using the Statistic Package for the Social Sciences (IBM SPSS for Windows, Version 20.0). Descriptive statistics and frequency distributions have been generated for all variables. Bivariate analysis has been done using the Chi-square test to discuss the differences in infection control measures, knowledge and compliance according to gender, specialization, geographic location of practice, and years of experience. Other tools such as tables have been used to present the response of the participants obtained from the survey. The question that has more than 80% positive answers was judged as the highest score, moderate if positive answers were between 60-79%, low if <60% positive answers. One-way ANOVA, Post-Hock tests, and others have been used to compare means overall compliance by years of experience, ownership of the clinic. Statistical significance has been set at ″p<0.05″, all repayments from participant dentists have been blinded and kept confidential. We used in this study Cronbach's alpha, which is a convenient test used to estimate the reliability, or internal consistency, of a composite score, also we depended

on internal validity which was related to how well a study is conducted (its structure).

3.8 Ethical Consideration

To carry out this study, an approval from the Office of the Institutional Review Board (IRB) of An-Najah National University was achieved, see APPENDIX (6). Participation in this study was voluntary, information about the aim of this study was provided to the participants, they also could withdraw from the study at any time without any punishment. It was confirmed that strict privacy was maintained all the time of the study period, and none of the participant details or names were mentioned, so the questionnaire was recorded using serial numbers.

Chapter Four

Results

4.1 Introduction

This chapter will provide the results and findings of the current study and clear what the study does achieve by assessing the infection control measures in the dental clinic in Nablus and Tulkarm districts, Palestine. These results will concern the standard precautions of infection control established by (CDC), and the Palestinian infection prevention and control protocol that was updated in 2010 by (PMH) to assess the dentists' knowledge, attitude and compliances with (ICM).

Furthermore, finding out the opinion of dentists about how to enhance the knowledge, and compliance toward/with infection and control measures between dentists and evaluating socioeconomic (dentist general characteristics) effects on the compliance with the infection control protocol. Also, assessing the difference in the implementation of infection control measures between Nablus and Tulkarm districts.

In order to present the results of the study, it is important to determine what is the meaning of "knowledge", "attitudes", "beliefs" and compliance.

Knowledge is defined as information that could be acquired through namely reading and experience and allows one to differentiate between right and wrong (Alharbi et al.., 2019). On the other hand, a person's

attitude towards something may be influenced by their underlying belief (Ajzen,1988). An attitude is a set of behaviors and beliefs toward a particular event. Attitudes usually come as a result of upbringing or experience, also they can have a high influence over behavior. Attitudes can also change despite the fact they are enduring (Stangor, 2014).

Compliance refers to changing the behavior of someone due to the direction or request. Compliance usually comes as a function of human behavior, so if one understands what affects and drives human behavior, can enhance a compliance culture (McLeod, S. A. 2014).

The results will be introduced in two parts. Part one presents the characteristics of the participants and their clinics. Part two presents the knowledge and compliance of the participants regarding infection control domains which are; hepatitis vaccination, PPE, (gloves, masks, eye protection, protective clothing, and footwear), washing hands, instruments sterilization, decontamination and cleaning, using of rubber dam, the usage of High-Volume Evacuator (HVE), protective mouth rinse, having a protocol for accidents with sharp instruments and finally having a puncture-resistant container for sharp instruments.

4.2 Participants Characteristics

As shown in the table below (participant characteristics table), the percentage of males was (58.9%) versus (41.1%) females from the total number of the sample size. The majority of the total participants were non-

specialists (75.1%), and (56.2%) of them were from Nablus district. Nearly a fifth of the participants (21.5%) were in dental practice for less than 5 years as were those practicing between 11-15 years. Twenty-four (24.2%) of the sample have experience between 6-10 years and (14.3%) of total participants were practicing for more than 20 years. Finally, concerning the ownership variable, eighty-nine (89.1%) of the total respondents were working in private clinics, (9.1%) in governmental and the least (1.8%) were working in UNRWA.

Table 4.1.: Participants Characteristics.

Gender	No.	%
M	156	58.9
F	109	41.1
Total	265	100.0
Educational level	No.	%
Specialist	66	24.9
General	199	75.1
Total	265	100.0
Governorate	No.	%
Nablus	149	56.2
Tulkarm	166	43.8
Total	265	100.0
Years of experience	No.	%
≤5	57	21.5
6-10	64	24.2
11-15	60	22.6
16-20	46	17.4
>20	38	14.3
Total	265	100.0
Ownership	No.	%
Private	236	89.1
Public	24	9.1
UNORWA	5	1.8
Total	**265**	**100.0**

4.3. Source of knowledge about Infection Control Measures

Most of the dentists (113 dentists) who represent (42.6%) of participants revived their knowledge and information about Infection Control Measures (ICM) from dental faculties, so this knowledge could be old and not align with the updated ones.

Less than 20% of dentists got their specializations related to updated information from scientific meetings and courses. (12.5%) of all sample sizes acquired their knowledge about (ICM) from postgraduate studies, and (10.6%) gained it from Dental journals (Table 4.2).

Table 4.2.: Source of knowledge about Infection Control Measures.

Knowledge and Information Sources on Infection Control Measures	No.	%
Dental faculties	113	42.6
Scientific meetings and courses	49	18.5
Postgraduate studies	33	12.5
Dental journals	28	10.6
Others	42	15.8
Total	**265**	**100.0**

4.4 The Extent of belief and Attitudes of the Dentists Toward the Transmission of Infectious Diseases.

The extent of the attitudes of the dentist toward the transmission of infectious diseases was a moderately positive response (A positive response to something indicates agreement) of (71.90%) (Table 4.3). In more detail, the participating dentists have an attitude that they need to learn more about infection control measures as the infection can be transmitted while practicing dental treatment by splatter/splash. Moreover, they consider that

vaccination is the most predictable way to prevent the spread of HBV with a positive response with the percentage of (78.50%, 97.00%, 97.40%, 74.00%, and 85.70%) respectively. While they recorded a low positive response regarding the question (Do you think that infection can be transmitted through the skin?), and a very low positive response regarding the belief that all pathogens causing infectious diseases needs a solid surface for transmission with the percentage of (50.60% and 20.40%) respectively.

Table 4.3.: The extent of belief and attitudes of the dentists about the transmission of infectious diseases

No.	Paragraph	Mean	S.D	Positive Response %
1	I need to learn more about Infection Control Measures.	0.78	0.41	78.50%
2	I think that infection can be transmitted while practicing dental treatment.	0.97	0.17	97.00%
3	I think that infection can be transmitted by splatter/splash.	0.97	0.16	97.40%
4	Infection can be transmitted through the skin?	0.51	0.50	50.60%
5	We can consider that AIDS is one of the most important infectious diseases in dental clinics.	0.74	0.44	74.00%
6	I believe that all pathogens that cause infectious diseases need a solid surface for transmission.	0.20	0.40	20.40%
7	I believe that vaccination is the most predictable way to prevent the spread of HBV.	0.86	0.35	85.70%
The total extent of belief and attitudes of the dentists toward the transmission of infectious diseases.		**0.72**	**0.16**	**71.90%**
*Cornbrash's Alpha: 0.79, Validity: 0.89				

*Validity=$\sqrt{Cornbrash'sAlpha}$

4.5. Infection Control Protocol Assessment Domains

This part of the chapter showed the compliance of the dentist participants in the different domains of the Palestinian infection control protocol for all health care settings and the international standards for infection control of the (CDC).

4.5.1. Hepatitis vaccination

The dentists who got the vaccine against HBV recorded a high positive response with a percentage of (90.60%), while all dental staff who received the vaccine against HBV recorded a moderately positive response with (69.40%). The overall compliance regarding Hepatitis vaccination was recorded a moderately positive response of (74.50%) (Table 4.4).

Table 4.4.: Hepatitis vaccination

No.	Paragraph	Mean	S.D	Positive Response %
7	I was vaccinated against HBV	0.91	0.298	90.60%
8	All dental staff were vaccinated against HBV	0.69	0.46	69.40%
Total hepatitis vaccination		**0.74**	**0.26**	**74.50%**
*Cornbrash's Alpha: 0.74, Validity: 0.83				

*Validity=√Cornbrash's Alpha

4.5.2. Personal Protective Equipment Compliance (PPE)

The overall compliance regarding using medical gloves among participants is high with a positive response of (96.10%). As they are highly concerned during the treatment procedure, they keen on discarding

the gloves after each task as well as after using them for each patient. Also, all dental staff takes care to use medical gloves regularly with high response of (97.70%), (97.3%), (97.00%), and (92.50%) respectively (Table 4.5).

Table 4.5: Wearing Gloves

No.	Paragraph	Mean	S.D	Positive Response %
4	Dentists wear gloves during the treatment procedure.	2.91	0.36	97.70%
5	Gloves are discarded after each task.	2.90	0.38	97.30%
10	Gloves are discarded after using them for each patient.	2.89	0.40	97.00%
13	All dental staff uses medical gloves and protective clothing in the work area.	2.52	0.63	92.50%
Total usage of medical gloves		**2.80**	**0.36**	**96.10%**
*Cronbach's Alpha: 0.80, Validity: 0.89				

*Validity=√Cornbrash's Alpha

Table 4.6 indicated a moderately positive response toward wearing the face mask during the dental procedure with (77.70%).

Table 4.6: Wearing the face mask during dental procedures

No.	Paragraph	Mean	S.D	Positive Response %
9	Dentists are wearing face masks during dental procedures regularly.	2.17	0.77	77.70%

Table 4.7 pointed out a moderately positive response regarding wearing eye Protection with (74.30%) by the dentists during the dental procedure.

Table 4.7: Wearing eye protection

No.	Paragraph	Mean	S.D	Positive Response %
8	Dentists are wearing eye protection during dental procedures regularly.	2.04	0.74	74.30%

The table below displays a moderately positive response regarding the use of a head cap with (65.00%). A moderate positive response regarding wearing disposable protective clothing and getting rid of it after each surgery with (72.80%) and a high positive response regarding wearing white coat or other clothes dedicated to working in the clinic with (91.00%). The overall compliance of the participants regarding wearing protective clothing, a head cap, and a white coat domain is moderate (76.30%).

Table 4.8: Wearing protective clothing, a head cap, and a white coat

No.	Paragraph	Mean	S.D	Positive Response %
6	Usage of the head cap	1.89	0.76	65.00%
7	Wearing disposable protective clothing and get rid of it after each surgery.	2.08	0.79	72.80%
11	Wearing white coat or other clothes dedicated to working in the clinic.	2.57	0.66	91.00%
Total of wearing Protective Clothing, a head cap, and a white coat.		**2.18**	**0.59**	**76.30%**
*Cronbach's Alpha: 0.73, Validity: 0.85				

*Validity=√Cornbrash's Alpha

The overall score of compliance of the participants with PPE is high (81.1%) for the means of four PPE domains; wearing of gloves (96.10%), a face mask (77.4%), eye protection (74.30%) as well as wearing protective

clothing, a head cap, and a white coat during the dental procedure (76.30%).

4.5.3. Hand Washing:

Table 4.9 below has shown a moderately positive response regards washing hands before and after a dental procedure with (77.80%) as well as a high positive response regards washing hands after touching mucous membranes, blood, and body fluids with (97.70%). While a low positive response regards replacing hand wash with alcohol hand rub when hands are visibly clean with (55.10%). The average response regards hand washing is considered as moderate with (76.10%) positive response.

Table 4.9: Hand washing response

No.	Paragraph	Mean	S.D	Positive Response %
1	Washing hands before and after a dental procedure	2.42	0.83	77.80%
2	Washing hands after touching mucous membranes, blood, and body fluids.	2.86	0.41	97.70%
3	Replacing hand wash with alcohol hand rub when hands are visibly clean.	1.70	0.71	55.10%
12	Washing hands after finishing the dental care procedures with anti-microbial hand wash.	2.23	0.84	73.70%
Total of hand washing		**2.30**	**0.53**	**76.10%**
*Cronbach's Alpha: 0.71, Validity: 0.84				

*Validity=√Cornbrash's Alpha

4.5.4.: Instruments Sterilization

According to table 4.10 shown below, participants registered a very high response to using wrapping bags for instruments sterilization as well

as the use of antiseptic for headpieces between patients and using an autoclave for sterilization between (90.60% and 94%). The same table displayed a moderately positive response regarding the use of washer-disinfectors to clean instruments also for the immersion of the used instruments in the decontaminant solution before washing with the percentage of (79.20% and 74.30%).

The usage of heat sterilization of hand tools, endodontic files, burs, and disinfection of impressions before sending to the laboratory as well as immersion of the used instruments in the decontaminant solution after washing was (61.10%), (57.00%), (55.10%), (52.80%), (43.80%) respectively. Whereas, the participants recorded a very low positive response towards using dry heat for sterilization as using an ultrasonic cleaner to clean instruments and use of heat sterilization for headpieces with the percentage of (13.60%), (21.00%) and (36.20%) in order.

Table 4.10: Instruments Sterilization

No.	Paragraph	Mean	S.D	Positive Response %
2	Using Ultrasonic cleaner to clean instruments	0.21	0.41	21.00%
3	Using Washer disinfector to clean instruments	0.79	0.41	79.20%
4	Immersion of the used instruments in decontaminant solution before washing	0.74	0.44	74.30%
5	Immersion of the used instruments in decontaminant solution after washing	0.44	0.50	43.80%
6	Disinfect impressions before sending to the laboratory	0.53	0.50	52.80%
7	Using Autoclave for sterilization	0.94	0.24	94.00%
8	Using dry heat for sterilization	0.14	0.34	13.60%
9	Using heat sterilization for hand tools	0.61	0.49	61.10%
10	Use of heat sterilization for headpieces	0.36	0.48	36.20%

11	Use of heat sterilization for burs	0.55	0.50	55.10%
12	Use of heat sterilization for endodontic files	0.57	0.50	57.00%
13	Use of wrapping bags for instruments sterilization	0.94	0.24	94.00%
14	Use antiseptic for headpieces between patients	0.91	0.29	90.60%
Total of instruments sterilization		**0.61**	**0.19**	**59.40%**
*Cronbach's Alpha: 0.71, Validity: 0.84				

*Validity=√Cornbrash's Alpha

4.5.5. Monitoring Autoclave

In table 4.11, participants presented a high positive response regarding their familiarity with methods for monitoring the autoclave effectiveness with (70.90%), while they recorded a low positive response regarding the monitoring and evaluation of the autoclave using chemical indicators with (42.30%), as well as a very low positive response, regards monitoring by using biological indicator once weekly at least with (28.30%).

Table 4.11: Monitoring Autoclave

No.	Paragraph	Mean	S.D	Positive Response %
15	I'm familiar with methods for monitoring and evaluating of effectiveness of the autoclave.	0.71	0.46	70.90%
16	Monitor and evaluate of effectiveness of autoclave using chemical indicators.	0.42	0.50	42.30%
17	Monitor and evaluate of effectiveness of Autoclave using biological indicator once weakly at least.	0.28	0.45	28.30%
Total of monitoring autoclave		**0.47**	**0.35**	**47.20%**
*Cronbach's Alpha: 0.71, validity: 0.78				

*Validity=√Cornbrash's Alpha

4.5.6. Decontamination and cleaning the surfaces

Regarding decontamination and cleaning the surfaces, the participants cover the surfaces that can't be decontaminated like a light cure and dental chair unit besides using disinfectant to clean surfaces before and after the treatment procedure with a total of (78%) (Table 4.12).

Table 4.12: Decontamination and cleaning the surfaces.

No.	Paragraph	Mean	S.D	Positive Response %
1	I cover surfaces that are difficult to be sterilized	2.25	0.77	80.00%
2	I cover light cure with special bags	2.05	0.83	68.00%
3	I use (throwable) baffles to cover the surfaces of my dental chair	2.06	0.77	73.30%
4	I remove the (throwable) barriers used to cover the surfaces after the treatment is finished	2.28	0.81	77.00%
5	I use any disinfectant to wipe off non-patient surfaces	2.65	0.63	91.70%
Total Decontamination and cleaning surfaces, using disposable protective barriers to cover some surfaces		**2.26**	**0.62**	**78.00%**
Cronbach's Alpha: 0.87, Validity: 0.93				

Validity=√Cornbrash's Alpha

4.5.7. Aerosol Control:

The overall compliance of participants toward aerosol control was low with a percentage of (55.1%). Nonetheless, a high positive response regarding using high volume evacuator to prevent the spreading of splatter (86.80%) (Table 4.13).

Table 4.13: Aerosol Control

No.	Paragraph	Mean	S.D	Positive Response %
1	Using Rubber Dam to prevent the spreading of splatter	0.31	0.47	31.30%
2	Using High Volume Evacuator to prevent the spreading of splatter	0.87	0.34	86.80%
3	Using Protective Mouth Rinse to prevent the spreading of splatter	0.47	0.50	47.20%
Total Aerosol Control		**0.55**	**0.30**	**55.1%**
Cronbach's Alpha: 0.73, Validity: 0.79				

Validity=√Cornbrash's Alpha

4.5.8. Accident Management

The participants showed a low positive response regards the availability of protocol for dealing with accidents in the clinic with (48.70%), as well as regard documentation of accidents and acute injuries in the clinic with (28.30%) and in having a method to dispose of medical waste in the clinic with (24.90%). Although the respondents recorded very high positive response regard having a puncture-resistant container for sharp instruments in the clinic with (90.60%) and high positive response regard asking patients about the medical history in the clinic (84.20%) (Table 4.14).

Table 4.14: Accident Management.

No.	Paragraph	Mean	S.D	Positive Response %
2	I have a protocol for accidents with sharp instruments in the clinic	0.49	0.50	48.70%
3	I have a puncture-resistant container for sharp instruments in the clinic	0.91	0.29	90.60%
4	I document accidents and acute injuries in the clinic	0.28	0.45	28.30%
5	I have a method to dispose of medical wastes in the clinic	0.25	0.43	24.90%
6	I'm asking patients about medical history in the clinic	0.84	0.37	84.20%
Total Accident Management		**0.55**	**0.26**	**55.30%**
Cronbach's Alpha 0.74, Validity: 0.78				

Validity=√Cornbrash's Alpha

4.5.9. Positive Response Percentage for Intended Domains

The table below (Table 4.15) shows the total positive response regard all infection control domains that have been included in the questionnaire. Whereas the participants gave the highest positive response for wearing gloves, then decontamination of the surfaces, vaccination against HBV, and personnel protective equipment. They gave aerosol control and accident management the lowest response.

Table 4.15: Positive Response Percentage for Intended Domains.

NO.	Intended Domain	Positive Response %
1.	Hepatitis vaccination	74.50%
2.	Wearing Gloves	96.10%
3.	Wearing a face mask during dental procedures	77.70%
4.	Wearing eye protection	74.30%
5.	Wearing Protective Clothing, head cap, and white coat	76.30%
6.	Hand washing	76.10%
7.	Instruments Sterilization	59.40%
8.	Monitoring Autoclave	47.20%
9.	Decontamination and Cleaning surfaces, using disposable protection parries to cover some surfaces	78.00%
10.	Aerosol Control	55.1%
11.	Accident Management	55.30%
Average of Positive Response Percentage for Intended Domains.		**70.0%**

4.5.10 Participants Opinions about the Enhancement of the Awareness toward (ICM)

The last question in the questionnaire was (In your opinion, how can we increase the awareness of dentists about infection control measures within Nablus and Tulkarm dental clinics?)

As shown in table (4.16), most of the dentists (202 dentists) which represents (96.2%) of participants revived that increasing awareness among dentists of the correct measures of infection control can be by lectures, dental magazines, social media, and regular conferences. (1.9%) of them suggested that the correct management of clinics can solve the problem and (1.9%) also suggested that the role of the (PMH) is very important by ongoing monitoring.

Table 4.16: Participants' Opinions about the Enhancement of the Awareness toward (ICM)

Opinion	Frequency	Percent
Correctly manage the dental clinics.	4	1.9%
Increase awareness among dentists about the correct measures of infection control by lectures, dental magazines, social media, and regular conferences.	202	96.2%
Ongoing monitoring by the Ministry of Health.	4	1.9%
Total	**210**	**100%**

4.5.11. Compliance of participants with Infection Control Protocol According to Gender

The table below, used the T-test to show that there is no real significant difference between (Male /Female), except in the domain of

accident management (p-value<0.05). The accident management in the Male group (Mean=0.73) is better than in the female group (Mean=0.64). A T-test is a statistical test that is used to compare the means of two groups. This test is used to determine whether there is any difference between the two groups (Kenton, 2020).

Table 4.17: Compliance of Participants with Infection Control Protocol According to Gender.

Domain	Gender	N	Mean	S.D	T	P-Value
Hepatitis vaccination	M	156	0.75	0.243	0.80	0.436
	F	109	0.73	0.285		
Wearing gloves	M	156	2.81	0.367	0.246	0.806
	F	109	2.80	0.354		
Wearing a face mask	M	156	2.15	0.760	0.567	0.571
	F	109	2.20	0.779		
Wearing eye protection	M	156	2.03	0.766	0.149	0.882
	F	109	2.05	0.712		
Wearing Protective Clothing, head cap and white coat	M	156	2.14	0.593	1.194	0.234
	F	109	2.23	0.593		
Hand washing	M	156	2.28	0.537	0.851	0.396
	F	109	2.33	0.514		
Instrument sterilization	M	156	0.60	0.181	0.862	0.390
	F	109	0.62	0.207		
Monitoring autoclave	M	156	0.49	0.304	1.217	0.225
	F	109	0.44	0.362		
Decontamination and cleaning the surfaces	M	156	2.25	0.333	0.127	0.899
	F	109	2.26	0.639		
Aerosol control	M	156	0.54	0.590	0.953	0.342
	F	109	0.57	0.295		
Accident management	M	156	0.73	0.286	2.421	*0.016
	F	109	0.64	0.327		

*p-value<0.05

4.5.12 Compliance of Participants with Infection Control Protocol According to Educational Level

The table below (table 4.18) used a T-test to show that there is a significant difference between a general practitioner and specialist groups only in wearing gloves, instruments sterilization, and accident management domains ″p<0.05″. As the specialists wear gloves with (Mean=2.70) better than the general practitioner (G.P) (Mean=2.84). While the specialists apply instrument sterilization and accident management with (Mean=0.55) and (Mean=0.59) versus (G.P) (Mean=0.62) and (Mean=0.73) respectively.

Table 4.18: Compliance of Participants with Infection Control Protocol According to Educational Level.

Domain	Educational Level	N	Mean	S.D	T	P-value
Hepatitis vaccination	General practitioner	199	0.76	0.235	1.707	0.089
	Specialist	66	0.70	0.324		
Wearing gloves	General practitioner	199	2.84	0.277	2.628	*0.009
	Specialist	66	2.70	0.532		
Wearing a face mask during dental procedures	General practitioner	199	2.18	0.744	0.408	0.684
	Specialist	66	0.14	0.839		
Wearing eye Protection	General practitioner	199	2.02	0.714	0.862	0.389
	Specialist	66	2.11	0.825		
Wearing protective clothing, head cap and white coat	General practitioner	199	2.19	0.561	0.727	0.468
	Specialist	66	2.13	0.684		
Hand washing	General practitioner	199	2.33	0.506	1.738	0.083
	Specialist	66	2.20	0.580		
Instrument sterilization	General practitioner	199	0.62	0.179	2.897	*0.004
	Specialist	66	0.55	0.219		

Monitoring autoclave	General practitioner	199	0.45	0.343	1.845	0.066
	Specialist	66	0.54	0.369		
Decontamination and cleaning surfaces	General practitioner	199	2.27	0.597	0.628	0.531
	Specialist	66	2.22	0.682		
Aerosol control	General practitioner	199	0.53	0.284	1.576	0.116
	Specialist	66	0.60	0.337		
Accident management	General practitioner	199	0.73	0.283	3.281	*0.001
	Specialist	66	0.59	0.350		

*p-value<0.05

4.5.13 Compliance of Participants with Infection Control Protocol According to Governorates

Data analysis by T-test (Table 4.19) clarified that there were significant differences between the two Governorates (Nablus and Tulkarm) ″p<0.05″ in seven domains; wearing gloves, wearing protective clothing, a head cap, and a white coat, hand washing, instruments sterilization, decontamination, and cleaning surfaces, using disposable protective barriers to cover some surfaces, aerosol control, and accident management. All these significant differences were in favor of Tulkarm versus Nablus Governorate by referring to the means for the seven domains mentioned in the table below.

Table 4.19: Compliance of Participants with Infection Control Protocol According to Governorate

Domain	Governorate	N	Mean	S.D	T	P-value
Hepatitis vaccination	Nablus	149	0.72	0.304	1.381	0.168
	Tulkarm	116	0.77	0.190		
Wearing gloves	Nablus	149	2.74	0.437	3.282	*0.001
	Tulkarm	116	2.89	0.204		
Wearing a face mask during dental procedures	Nablus	149	2.12	0.805	1.179	0.239
	Tulkarm	116	2.23	0.715		
Wearing eye protection	Nablus	149	1.99	0.771	1.272	0.204
	Tulkarm	116	2.10	0.703		
Wearing Protective Clothing, head cap, and white coat	Nablus	149	2.11	0.635	2.121	*0.035
	Tulkarm	116	2.26	0.525		
Hand washing	Nablus	149	2.19	0.575	3.851	*0.000
	Tulkarm	116	2.44	0.422		
Instrument sterilization	Nablus	149	0.57	0.203	3.293	*0.001
	Tulkarm	116	0.65	0.169		
Monitoring autoclave	Nablus	149	0.45	0.348	1.278	0.202
	Tulkarm	116	0.50	0.353		
Decontamination and cleaning surfaces, using disposable protection barriers to cover some surfaces	Nablus	149	2.15	0.647	3.269	*0.001
	Tulkarm	116	2.39	0.552		
Aerosol control	Nablus	149	0.51	0.302	2.694	*0.008
	Tulkarm	116	0.61	0.287		
Accident management	Nablus	149	0.65	0.336	2.967	*0.003
	Tulkarm	116	0.76	0.251		

*p-value<0.05

4.5.14 Compliance of Participants with Infection Control Protocol According to Years of Experience

The Post-Hoc test has been used, Post Hoc (“after this” in Latin) tests is used when there are specific differences between three or more group means, when an analysis of (ANOVA) F test is significant. The Post

Hoc tests also allow the statistical analyst to determine those specific differences (Allen, 2017).

Accordingly, data analysis by Post-Hoc test (Table 4.20) revealed that there were significant differences in wearing gloves, wearing protective clothing, a head cap, and a white coat, handwashing, monitoring autoclave, decontamination, and cleaning surfaces, using disposable protection barriers to cover some surfaces, and accident management domains attributed to the years of experience variable ″P<0.05″, the Post-Hoc test showed that the group (16-20) with means of 2.66,1.84, 1.80, 0.33, 1.83 and 0.53 respectively was so the latter was lower than all other groups.

Moreover, a significant difference in wearing eye protection domain attributed to the years of experience variable ″P<0.05″ as the Post-Hoc test showed that the group (>20) with mean=2.18 was higher than all other groups.

Significant differences in instruments sterilization domain attributed to the years of experience variable ″P<0.05″ has been documented and the Post-Hoc test showed that the group (≤5) with a mean=0.68 is higher than all other groups.

Finally, there were significant differences in the aerosol control domain attributed to the years of experience variable ″P<0.05″ as the Post-Hoc test noticed that the group (≤5) with a mean=0.61 was higher than all other groups.

Table 4.20: Compliance of Participants with Infection Control Protocol According to Years of Experience.

Domain	Years of Experience	N	Mean	S.D	F	p-value
Hepatitis vaccination	≤5 years	57	.75	.243	0.177	0.950
	6-10 years	64	.73	.253		
	11-15 years	60	.75	.295		
	16-20 years	46	.76	.303		
	>20 years	38	.72	.191		
Wearing Gloves	≤5 years	57	2.87	.178	2.594	*0.037
	6-10 years	64	2.82	.361		
	11-15 years	60	2.81	.343		
	16-20 years	46	2.66	.495		
	>20 years	38	2.84	.373		
Wearing face mask during dental procedures	≤5 years	57	2.09	.662	1.702	0.150
	6-10 years	64	2.30	.810		
	11-15 years	60	2.30	.743		
	16-20 years	46	2.02	.882		
	>20 years	38	2.05	.695		
Wearing eye protection	≤5 years	57	2.04	.626	3.773	*0.005
	6-10 years	64	2.11	.819		
	11-15 years	60	2.15	.709		
	16-20 years	46	1.67	.762		
	>20 years	38	2.18	.692		
Wearing Protective clothing, head cap and white coat	<5 years	57	2.22	.447	5.812	*0.000
	6-10 years	64	2.34	.631		
	11-15 years	60	2.26	.583		
	16-20 years	46	1.84	.662		
	>20 years	38	2.11	.498		
Hand washing	≤5 years	57	2.50	.408	16.352	*0.000
	6-10 years	64	2.42	.500		
	11-15 years	60	2.34	.463		
	16-20 years	46	1.80	.519		
	>20 years	38	2.34	.488		
Instrument Sterilization	≤5 years	57	.68	.147	5.801	*0.000
	6-10 years	64	.64	.214		
	11-15 years	60	.58	.208		
	16-20 years	46	.55	.165		
	>20 years	38	.53	.173		

Monitoring Autoclave	≤5 years	57	.47	.350	2.908	*0.022
	6-10 years	64	.51	.346		
	11-15 years	60	.54	.325		
	16-20 years	46	.33	.355		
	>20 years	38	.46	.360		
Decontamination and cleaning surfaces, using disposable protection barriers to cover some surfaces	≤5 years	57	2.43	.525	7.675	*0.000
	6-10 years	64	2.36	.621		
	11-15 years	60	2.29	.537		
	16-20 years	46	1.83	.694		
	>20 years	38	2.28	.567		
Aerosol Control	<5 years	57	.61	.294	2.627	*0.035
	6-10 years	64	.59	.275		
	11-15 years	60	.54	.319		
	16-20 years	46	.44	.282		
	>20 years	38	.53	.306		
Accident Management	≤5 years	57	.79	.266	5.163	*0.001
	6-10 years	64	.73	.320		
	11-15 years	60	.68	.331		
	16-20 years	46	.53	.267		
	>20 years	38	.72	.277		

*p-value<0.05

4.5.15 Compliance of Participants with Infection Control Protocol According to Ownership of the dental clinic (Private, Public, UNRWA)

Table 4.21 has shown that there were significant differences in Wearing a face mask during a dental procedure, wearing eye protection, monitoring autoclave and aerosol control domains attributed to the ownership variable ″P<0.05″, the Post-Hoc test showed that the UNRWA group with means of 1.40,1.00, 0.13, 0.27 respectively were lower than all other groups.

The same table presented that there were significant differences in wearing protective clothing, a head cap and a white coat, hand washing and decontamination and cleaning surfaces, using disposable protection barriers to cover some surfaces domain attributed to the ownership variable

″P<0.05″ and the Post-Hoc test showed that the private group with means of 2.21, 2.36 and 2.32 orderly was higher than all other groups.

Table 4.21: Compliance of Participants with Infection Control Protocol According to Ownership (private clinic, public clinic, or UNRWA clinic).

Domain	Ownership	N	Mean	S.D	F	p-value
Hepatitis vaccination	Private	236	.74	.265	0.394	0.675
	Public	24	.78	.248		
	UNRWA	5	.80	.112		
Wearing Gloves	Private	236	2.81	.365	0.692	0.501
	Public	24	2.76	.350		
	UNRWA	5	2.65	.224		
Wearing a face mask during dental procedures	Private	236	2.17	.757	0.3443	*0.033
	Public	24	2.38	.770		
	UNRWA	5	1.40	.894		
Wearing eye protection	Private	236	2.08	.722	5.993	*0.003
	Public	24	1.88	.850		
	UNRWA	5	1.00	.000		
Wearing Protective Clothing, head cap, and white coat	Private	236	2.21	.584	7.599	*0.001
	Public	24	2.01	.577		
	UNRWA	5	1.27	.149		
Hand washing	Private	236	2.36	.502	15.046	*0.000
	Public	24	1.90	.500		
	UNRWA	5	1.55	.447		
Instruments Sterilization	Private	236	.61	.194	1.606	0.203
	Public	24	.59	.183		
	UNRWA	5	.46	.039		
Monitoring Autoclave	Private	236	.49	.350	4.758	*0.009
	Public	24	.33	.326		
	UNRWA	5	.13	.183		
Decontamination and cleaning surfaces, using disposable protection barriers to cover some surfaces	Private	236	2.32	.573	16.928	*0.000
	Public	24	1.92	.729		
	UNRWA	5	1.00	.000		
Aerosol Control	Private	236	.56	.300	3.087	*0.047
	Public	24	.49	.278		
	UNRWA	5	.27	.149		
Accident Management	Private	236	.70	.311	1.203	0.302
	Public	24	.67	.282		
	UNRWA	5	.50	.000		

*p-value<0.05

Chapter Five

Discussion and Recommendation

5.1 Introduction

This chapter will present the assessment of the dentist's knowledge, attitude and, compliances about/with infection control protocol according to the Palestinian infection control protocol, which is prepared for all health care settings and CDC guidelines regarding infection control protocol.

5.2 Knowledge, belief and Attitudes of the Dentist about the Transmission of Infectious Diseases

The current study noted that (42.6%) of participants revived their knowledge and information about Infection Control Measures (ICM) from dental faculties, whereas (18.5%) of dentists got updated information by scientific meetings and courses, (12.5%) during Postgraduate studies and (10.6%) of them from dental journals. A study conducted in Lebanon to evaluate infection control knowledge, attitude, and practice in Lebanese private dental clinics revealed that the source of knowledge about infection control was firstly from dental school courses with a percentage of (89.5), whereas, a scientific meeting was the second source with a percentage of (31.9), then postgraduate courses (23.6%) and dental journal (20.5%) (Dagher et. al, 2017). Here it has been noticed the importance of the serious role that academic schools, scientific meetings, and other sources play in forming the knowledge and specialization system for a dental specialist.

So, (78.50%) of participants in the current study think that they need to learn more about infection control measures. Other dental colleagues engaged in a multi-center cross-sectional study in Jeddah reported that they have high levels of adequate infection control practices in the prosthodontic clinic despite the moderate level of their satisfaction with their knowledge (Halawani et al., 2020). Nearly, (97%) of participants agreed that infection could be transmitted while practicing dental treatment or by splatter, this finding agrees with another study done in 2014 by (Kateeb et al) about the attitudes of dentists to scheduling HIV and HBV patients, appointments of HIV disease were refused by (68%), and those of HBV were refused with (32%) (Kateeb, Amer, and Bajali, 2014). This means that one-third of dentists refused to treat patients with blood-borne diseases, and about two-thirds of dentists refused to treat patients with HIV disease. It is not surprising that patients with COVID-19 will not declare their health status. The patients are afraid that the doctor will refuse to treat them. But, surprisingly, (50.60%) of the study sample think that infection could be transmitted through the skin and (20.40%) believe that all pathogens that cause infectious diseases need a solid surface for transmission although (85.70%) of respondents believe that vaccination is the most predictable way to prevent the spread of HBV.

These responses pointed to inadequate knowledge in some sensitive points as well as poor beliefs. Therefore, attitudes and compliance towards Infection Control Measure among the dentists. Accordingly, it is the responsibility of the Palestinian Ministry of Health (PMH) and Dental

Association to provide and follow up the continuing education about measures of infection control to improve the performance of dentists as well as the quality of services in the dental clinics in both districts.

5.3 Compliance with Infection Control Protocol in Nablus and Tulkarm Districts

5.3.1 Hepatitis Vaccination

Eighty-five (85.70%) of respondents believe that vaccination is the most predictable way to prevent the spread of HBV, which is a high percentage and exhibit good knowledge about the importance of vaccination, but if we compare this result with another one that was done in Hebron in 2017, the study revealed that compliance with hepatitis vaccination was 98.2%, which reflects that dental practitioners in Hebron are more compliant regard H.V than those in Nablus and Tulkarm. Although moderate responses (74.50%) were recorded toward HBV vaccination (dentists and their staff), the respondent dentists agreed that they got vaccines with high responses (90.6%) versus moderate responses (69.40%) for their staff. In a study aimed to investigate the level of infection-control practices among dental health care providers in Jordan-2020, the majority of the participants vaccinated against hepatitis B was (82.1%) (Mahasneh et al., 2020). A study was done in Saudi Arabia in 2012 among 402 Saudi or expatriate dentists working in Saudi Arabia. Nearly, seventy-four of them had been vaccinated. The vaccination coverage amongst dentists ranged between 68-100%, according to Leggat

et al. (2001) and Yengopal et al. (2001) report from Saudi Arabia, the United Kingdom, the United States of America, Thailand, Nigeria, and Caribbean countries (Aldharrab and Al Samadani, 2012).

This current study revealed that there were no significant differences based on socioeconomic characteristics regarding HBV vaccination. But the variance in the compliances between dentists and staff responses to HBV vaccination pointed to the requirement to focus on receiving the vaccination for all the working staff in dental clinics by concerned authorities. Particularly, we are living under the greatness of the COVID 19 pandemic, so the medical teams wherever need to be armed with strong immunity as well as possible.

5.3.2 Personal Protective Equipment (PPE)

Gloves, face Masks, eye protection, and protective clothes are some kinds of (PPE) which are highly recommended by (CDC) (CDC, Aug 28 (2020)). All (HCW) should wear (PPE) to protect skin and mucous membrane against infected blood and other (PIM) (Manitoba Health, Seniors and Active Living, Jun 2019).

Gloves: Using gloves is considered a very important measure that should be followed by all (HCW) to protect their skin from blood and other (PIM) during practicing their daily work (CDC, Jul 16 (2020)). Gloves should be discarded after finishing the task and a new pair of gloves must be worn for the new patient (Rasin, 2020).

In this study, the compliance to gloving is high (96.10%) that reflects good information and knowledge about the importance of gloving among (OHCW) participants, when we compare this finding with another one in Hebron in 2017 in which the compliance was (69.95%), we can discover that knowledge and compliance are better among dental practitioners in Nablus and Tulkarm than those in Hebron. As well as discarding gloves after each task and between patients was (97.30%) and (97.00%). These results were better when comparing them with another study made among a group of military dentists in April 2009 (Jibreen, Khouri and Dababneh, 2009), the majority of those dentists (94.2%) always wore gloves, but only 81.6% of them discard their gloves between patients (Jibreen, Khouri and Dababneh, 2009). Good knowledge among participant dentists about how much are the contaminated gloves enhance the spread of infection between patients and also among the same patient as from one tissue to another has been evidenced. Wearing gloves and protective clothes by dental staff has a high response with (92.50%) which also reflects good knowledge and compliance among dental staff.

The same current study revealed that there were significant differences in wearing gloves attributed to the educational level variable (P-value<0.05), the T-test showed that specialists with a mean of 2.70 lower than the general practitioners with a mean of 2.84, this difference in gloving compliance may be because specialists consider themselves very far from any risk because of their high skills. The study also revealed that there were significant differences in wearing gloves attributed to the

Governorate variable (P-value<0.05). The T-test showed that Nablus district with a mean of 2.74 lower than Tulkarm district with a mean of 2.89, this means that the presence of high knowledge about the importance of gloving among Tulkarm dentists may be because of the awareness activities which were done by the dental association- Tulkarm branch to enhance the educational situation among its dentists. This study also revealed that there were significant differences in wearing gloves attributed to the years of experience variable (P-value<0.05). The Post-Hoc test showed that the group of (<5 years) with a mean of 2.87 was higher than other groups and this may be because of the updated knowledge among the new graduate practitioners who are keen to apply what they recently learn.

Mask: (OHCW) should wear masks to protect themselves and their patients from microorganisms, blood or any body fluids spatter during the dental care procedure (Hendrick, 2020 a). According to the ADA, single-use disposable masks are recommended as a standard precaution during treatment in a dental practice, taking into consideration that wearing masks for long periods of time is unhealthy and not recommended (ADA, 2020a). Respirators, such as N95s, are very important these days and a new addition to dentistry's PPE, because, many dental procedures across the United States as well as all over the world are returning to providing care for patients. In the USA, the use of N95 masks or respirators is implementing for dental practitioner's protection. Dentists should use N95s as recommended by the CDC and OSHA during the treatment procedures for a patient who is positive or suspected to be positive for COVID-19 to

avoid the risk of exposure through aerosols in the dental environment (Hendrick, 2020 b). A high percentage (97.40%) of participants thought that infection can be transmitted by splatter/splash that retails good knowledge about the importance of wearing protective masks while the compliance with a face mask during a dental procedure in this study among participants is moderate (77.70%). This result exhibited less adherence than Lebanese dentists which was recorded (89.1%) in 2017 (Dagher et al., 2017). Also, the study indicated that there are significant differences in wearing a face mask during dental procedures attributed to the ownership variable (P-value<0.05). The Post-Hoc test showed that the UNRWA group, including the mean of 1.40 was the lowest of all other groups. This result means that there is a problem in dental care provided by UNRWA dental clinics. These clinics provide dental services for a large number of refugees in more than five camps in two Governorates. Competent committees from (PMH) or from UNRWA camps need to enforce the infection control system.

Eye Protection: Microbial contamination, some physical injury, and possible consequent infection to the eyes could be prevented using eye protection measures (Eldridge, 2017). Eye protection is a very important means to protect patients and dentists from splatter, blood, saliva, or any secretions during the dental care procedure (Schrubbe, 2017). During the COVID-19 pandemic, direct evidence considered that healthcare workers' conjunctiva could be highly exposed to aerosol and infective droplets from patients during the dental procedure and close contact. It is important to

assess the risk of every procedure and take appropriate precautions because close contact is necessary as well as the guidance for full (PPE) should be followed (Khunti et al., 2020). The compliance with eye protection is moderate among participants with (74.30%). This means fair knowledge about the importance and indicators for eye protection, compared with participants in a study mentioned above that was done among a group of military dentists in April 2009. (50.57%) never used eyeglasses or protective face shields (Jibreen, Khouri, and Dababneh, 2009). A study in Hebron in 2017 revealed that only (12.8%) of dental practitioners were compliant with eye protection. The study explained that there were significant differences in wearing eye protection attributed to the years of experience variable ″P<0.05″. The Post-Hoc test showed that the group (>20 years) with a mean of 2.18 was the highest among all other groups, this group of practitioners of old ages (compared with other groups) may have eye problems, so they know very well about the importance of using eye-protective measures.

Wearing Protective Clothing, a head cap, and a white coat: the use of protective clothing, a head cap and a white coat is very important during dental care procedures to protect both the dentist and his/her staff from any injury or microbial contamination during dental care procedures. During the COVID-19 pandemic, we should consider that the main route of virus transmission is by airborne droplet, mainly in hospitals and dental clinics, (PPE) including protective eyewear, gloves, masks, caps, protective outwear, and face shields, are strongly recommended for all (HCWs) in

hospitals and clinic setting (YouTooth, 2020). This study showed that (76.30%) of the participants comply with Wearing Protective Clothing, head cap, and white coat. There are significant differences in wearing eye protection that attributed to the Governorate variable ″P<0.05″. The T-test showed that the Nablus group with a mean=2.11 lower than the Tulkarm group with a mean=2.26. These readings illustrate the need to encourage the competent committee in the Nablus district to provide more knowledge to dental practitioners about infection control measures. This study also, showed that there were significant differences in wearing protective clothing, a head cap, and a white coat attributed to the years of experience variable ″P<0.05″. The Post-Hoc test showed that the group of (11-15 years) with a mean=2.26 higher than all other groups that are because of good knowledge among this group of practitioners about the importance of protective clothing, a head cap, and a white coat. The study also revealed that there were significant differences in wearing protective clothing, a head cap, and a white coat attributed to the ownership variable ″P<0.05″. The Post-Hoc test showed that the private clinics with a mean=2.21 higher than other groups this may be, because, the dentist in the private clinic is assiduous to appear in a good appearance in front of clients.

Generally, the compliance with all (PPE) measures among the participants is (65.00%) which means more efforts by the competent committees have to be done. These committees are the Palestinian Ministry of Health (PMH) or Dental Association or both. Efforts should concentrate to increase knowledge and awareness of the dentists about infection control

programs by educating them about the measures of infection control through medical and scientific meetings or medical conferences, especially that (97.00%) of participants believe that infection can be transmitted while practicing dental treatment, and (74.00%) of them consider that AIDS is one of the most important infectious diseases in dental clinics, but at the same time the compliance to (PPE) is not high and the participants don't do a high effort to protect themselves, staff and their patients. A study done in Mar 2020 reveals that (HCWs) used gloves and face masks more than any other (PPE) to protect them from infections and respiratory diseases. Overall compliance and attitudes to the use of PPE were low (khan and Chughtai, 2020).

5.3.3 Hand Washing

Hand washing is believed as the most effective way of preventing the transfer of pathogens from patients to health care providers and vice versa. Pathogens can transmit from the hands of (HCW) causing healthcare-acquired infection. Cross-infection transmission in health care centers can take place in two ways. The first way is directly from hands, and the second one is indirect from environmental sources via hands. These two ways are considered as the most important factor in the current infection threats the dental care patients (Vos, 2018). A low percentage of participants (50.60%) think that infection can be transmitted through the skin, which can lead to non-compliance with handwashing measures. The overall attend hand washing is moderate among participants with (76.10%),

and moderate compliance with (77.80%) regards washing hands before and after dental procedures. This is a low result compared with a study done in Jordan which revealed that hand washing after treatment was (83.2%) and prior to starting treatment (66.3%) and about one-half (45.8%) usually reported washing hands before wearing gloves (Mahasneh et al., 2020). This reflects good knowledge about the importance of handwashing between practitioners. High attendance toward washing hands after touching mucous membranes, blood, and body fluids with (97.70%). This also reflects good knowledge among participants about the role of mucous membranes, blood, and body fluids in transmitting infectious diseases. Moderate compliance with (73.70%) regard washing hands after finishing dental care procedures with an anti-microbial hand wash that may be because some dentists consider that there is no need for hand washing if gloving is performed. Low compliance among participants toward replacing hand wash with alcohol hand rub when hands are visibly clean with (55.10%), this also mirrors low knowledge about the importance of hand sterilization even when hands are visibly clean because microorganisms are not visible. The study reported significant differences in handwashing attributed to the Governorate variable (P-value<0.05). The T-test showed that Nablus district with a mean=2.19 lower than Tulkam with a mean=2.44, this reflects the need to increase the awareness toward handwashing measures among Nablus dental practitioners by increasing the educating activities of the dental association- Nablus branch. The study also indicated significant differences in handwashing attributed to the years

of experience variable ″P<0.05″. The Post-Hoc test showed that the group (<5 years) with a mean=2.50 higher than all other groups, this observation enforces what has been said before that the newly graduated practitioners may be keener on applying the updated knowledge, they learned with high working capacity. Significant differences in handwashing attributed to the ownership variable ″P<0.05″ were seen. The Post-Hoc test showed that UNRWA with a mean=1.55 lower than other groups, this may be because of the high work pressure on UNRWA dental clinics and huge numbers of patients visiting these dental clinics causing a shortage of time to apply hand washing carefully after each dental task.

5.3.4 Instrument Sterilization

Autoclaving (steam under pressure) is the best choice of instrument sterilization in the dental field and the most effective one (Diatech, 2020), this way of sterilization received a very high degree of compliance (94.00%) among participants. This result is high compared with another one in a study among Lebanese dentists in 2017 which showed that steam autoclaving is the preferred means of sterilization (65%) (Dagher et al., 2017). Another study was in Hebron-Palestine in 2017 reveals that the response regarding instrument sterilization is relatively low positive which is (42.8%) (Hroub, 2017). If we compare this result which is in the south of Palestine with the result of our study, which is in the north in which high degree of compliance is (94.00%) among participants, this means more knowledge and compliance among dental practitioners in the north regard

instrument sterilization had been taken into consideration. The result of the current study reflects good knowledge about the ways of sterilization. A very low compliance with using an ultrasonic cleaner to clean instruments with (21.00%) has been reported. The best way for sterilizing hand pieces is autoclave sterilization (Acosta-Gio et al., 2017). This study shows low compliance of participants regard using heat sterilization for headpieces (autoclaving) with (55.10%). This result is better than another one in Khartoum State, Sudan dental clinics in which (7.2%) of the dentists sterilized hand-pieces (Idris, 2012). India dental clinic is better regarded sterilization protocol in which about (87.62%) of the Indian dental clinics follow the standard sterilization protocol published by the CDC and ADA (Pala et al., 2016). The low compliance regard autoclaving hand pieces in this study may be due to low of knowledge about the best method of hand-pieces sterilization or because of the high price of such equipment. Some dentists do not have a sufficient number of it. Most of dental practitioners have either one or two of headpieces, and few of them own three, and this shortage can be interpreted as a lack of equipment. Most of the participants use antiseptics and disinfectants for headpieces between patients rather than autoclaving with high compliance (90.60%). Unfortunately, this procedure does not disinfect or sterilize the interior portions of the dental headpieces, and so this is far below the current recommendation (Sasaki and Imazato, 2019). Low compliance (55.10%) of participants using heat sterilization for burs (autoclaving) has been reported. Approximately two-thirds of the participants in a Lebanese cross-sectional study reported that heat-

sterilizing for endodontic files is (60.3%) and for burs is (65.3%) (Dagher et al., 2017). Dental burs are connected to headpieces to work, so if there is no professional sterilization for headpieces, burs will be easily contaminated. There is a lack of knowledge and skills among participants about the mechanism of the transfer of pathogens from sterile to non-sterile items. Using heat sterilization (autoclaving) for endodontic files has a low compliance among participants with (57.00%) comparing that with postgraduate (PG) students from dental colleges in Bangalore with 88% acceptance endodontic files need to be sterilized (Halappa, Aslam and Panuganti, 2014). A moderate compliance (61.10%) regard heat sterilization for hand tools (autoclaving) and low compliance regard disinfect impressions before sending them to the laboratory with (52.80%) has been documented. These results were better than another one done in 9 dental colleges of Karachi in 2014 which showed that (41%) of the practitioners washed impression trays before taking dental impressions, and only one third of practitioners disinfected impression material appropriately as well as more than one third never do impression scrubbing after finishing impression (Sheikh et al., 2014). A moderate using washer disinfector to clean instruments with (79.20%). These are moderate and low compliance findings represent low knowledge about the best methods of sterilizations so great effort should be performed by competent committees to increase awareness among dentists regard infection control protocol. Immersion of the used instruments in the decontaminant solution before washing is recommended to ensure the cleaning and sterilization for

patient care (Caston-Gaa and Ruparelia, 2018). (74.30%) of participants immerse the used instruments in the decontaminant solution before washing which is a moderate compliance percentage. And a low compliance (43.80%) regard immersion of the used instruments in decontaminate solution after washing. In a study done in dental colleges in Bangalore, (74%) reported that dental assistants are not trained on sterilization protocol (Halappa, Aslam and Panuganti, 2014). The use of wrapping bags for instruments sterilization is recommended by CDC to protect them from being contaminated after sterilization (CDC, Feb 16 (2016); OR Manager, 2016). Participants in this study show a high compliance regard use of wrapping bags for instruments sterilization with (94.00%) which reflects high knowledge about the necessity of wrapping instruments before cycling. The current study reported significant differences in instrument sterilization attributed to the educational level variable ″P<0.05″. The T- test showed that specialist group with a mean=0.55 lower than (GP) group with a mean=0.62. This means good knowledge among (GP) group about the importance of sterilization and at the same time seriousity in the application of this method are more than in the specialist group. It also revealed that there were significant differences in instrument sterilization attributed to the Governorate level variable ″P<0.05″. The T- test showed that Tulkarm group with a mean=0.65 is higher than the Nablus group with a mean=0.57, these results support what has been said previously that Tulkarm dentists have good knowledge about the means of infection control measures and there they are keen to applying

these measures more than Nablus dentists. This practice may be because of many reasons. One of these reasons is good awareness activities were done by the competent committees in Tulkarm district. These activities included medical conferences, regular and periodic inspection on dental clinic in Tulkarm district or medical meetings, including lectures to raise the awareness of applying (ICM). This study also showed significant differences in instrument sterilization attributed to the years of experience variable ″P<0.05″. The Post-Hoc test showed that the group of (<5 years) with a mean=0.68 higher than all other groups. This result supports the essay which indicates that the newly graduated practitioners are more serious to applying the updated knowledge they learned with high positive energy. This could be attributed to the argument that adherence to infection control guidelines which are maintained by the students during education time starts to fade gradually after they commence the practical life (Gordonet, et al., 2001).

5.3.5 Monitoring Autoclave

Mechanical, chemical, and biological indicators are used to evaluate the effectiveness of sterilization procedures in dental clinics (Jane, 2017).

This part of the study refers to the use of mechanical, biological, or chemical indicators to evaluate the effectiveness of the sterilization procedure. The results indicated a moderate response as (70.90%) of the participants are familiar with methods for monitoring and evaluating the effectiveness of autoclave, and only (47.20%) of participants do autoclave

monitoring, which is low in comparison with another study conducted in Karachi that (50.1%) never monitored sterilization (Ahmad, 2015). This may be due to undiscovered malfunction in some autoclaves in the participant's dental clinics which means the failure of sterilization procedure and lack of knowledge about the importance of continuous evaluation of the autoclave.

Chemical Evaluation: Chemical indicators are used to show and discover any errors that may occur during the process of sterilization, but do not ensure sterilization. There are two types of chemical indicators, external and internal, the external chemical indicators are usually located outside the packaging of instruments. These two types of indicators are used to emphasize that the instrument packaging has been processed correctly during the sterilization cycle (OSHA Review, 2017; Uguzzoni, 2020). Only (42.40%) of all participants monitor and evaluate the effectiveness of autoclave using chemical indicators which is a very low percentage compared with the results of another study in Karachi 2015 with (19.5%) use chemical monitoring (Ahmad, 2015). The results of this study reflect a lack of knowledge about chemical indicators or not using this indicator at all.

Biological Evaluation: It is the most credible method for evaluating sterilization because it directly evaluates the killing of highly resistant pathogens rather than just evaluating physical and chemical conditions necessary for sterilization (STERIS Healthcare, 2020). Biological

indicators should be used at least once weekly to ensure the best sterilization cycle (OSHA Review, 2017). In this study (28.30%) of all participants monitor and evaluate the effectiveness of autoclave using biological indicator once a week at least which is a low percentage, but it is better than the results in dental care offices in Mexico in which 20% of practitioners used biological indicators (Patiño-Marín et al., 2015). Another study showed that (2.8%) of dentists use biological monitoring (Ahmad, 2015). The result of the current study indicated the improper sterilization procedure done in these dental clinics and even though the dentists are keen to do autoclaving, it could be done in an inoperable autoclave. This study showed that there were significant differences in monitoring autoclave attributed to the years of experience variable ″P<0.05″. The Post-Hoc test showed that the group (11-15 years) with mean=0.54 are higher than all other groups, this reflects high compliance and keenness to ensure the success of the sterilization cycle among this group this because during a long period of work, experience and seeking for update knowledge more than other dental practitioners, as the dental practitioner can discover that some failure of dental procedures comes from inappropriate instrument sterilization, so he can recognize the importance of monitoring autoclave for successful sterilization. This study also showed that there were significant differences in monitoring autoclave attributed to the ownership variable ″P<0.05″. The Post-Hoc test of the private group with a mean=0.49 is higher than other groups. This result may emphasize that they are assiduous to appear in a good appearance in front of their patients

besides the practitioner. In general, autoclave monitoring means that dentists should stop work completely in case of malfunction, but most dentists agree that continuity of work or stopping it depends on the nature of the dental care procedure. For example, you can do cavity preparation procedures despite failing sterilization because this procedure is safe (as they think). Those dentists forget that during cavity preparation dentists can easily transfer microorganisms (transmit infection) by dentinal tubules or accidentally opening dental pulped.

5.3.6 Decontamination and Cleaning surfaces, using disposable protection barriers

Environmental surfaces are those that do not come in contact directly with patients. They are of two types: housekeeping surfaces (e.g., floors) and clinical contact surfaces (e.g., radiograph equipment). Hand contact of these surfaces (which is considered as a reservoir for microbial contamination) can play a major role in transmitting the pathogens. This indicates that to reduce the transmission of infectious pathogens, hand hygiene has an important role to play in this route. The other methods that are very important are decontamination and cleaning surfaces, and the use of disposable protection barriers (DePaola and Gran, 2019). This study showed that a moderate percentage (78.00%) of participants do decontamination and clean surfaces and use disposable protection barriers to cover some surfaces, a high percentage (91.70%) of them used disinfectant to clean surfaces away from patient contact between patients,

comparing with other dentists in which they use disinfectant agents by (28.9%) (Ibrahim et al., 2017). The high result of this study reflected high awareness and high information about the importance of disinfection in the dental environment, also a high percent (80.00%) of all participants regard covering surfaces that can't be decontaminated which in another study, the surface barriers for dental unit surfaces were used by (70.2%) of private dental clinics (Mahasneh et al., 2020). The result of this study also reflected good compliance to cleaning and disinfection. (68.00%) of all participants cover light cure with special bags and (73.30%) of them use disposable protection barriers to cover the dental unit chair. These two environmental surfaces are highly touched by dentists and staff hands so it can be the main source of bacterial transmission. These results pointed out a moderate awareness among participants regards these surfaces so they still need more knowledge to improve their compliance to disinfection. After the dental procedure is finished the disposal covers should be disposed away from the dental environment because it may contain pathogens which can transmit to others (Scotland Dental Clinical Effectiveness Program, Jan 2016). This study shows that (77.00%) of all participants discard the disposable protection barriers after finish the procedure, this moderate result is better than the result documented by Idris (2012) in which none of the study dentists used plastic barriers to cover the clinical contact surfaces (Idris, 2012). These moderate responses have to be increased by enhancing knowledge among dentists and their staff and by informing patients about the curiosity of seeing the dentist or the assistant changes these disposal

barriers. The study analysis exhibited that there were significant differences between Nablus and Tulkarm dental clinics in favor of Tulkarm clinics in decontamination and cleaning surfaces and using disposable protection ″P<0.05″. Tulkarm clinics (Mean=2.39) have decontamination and cleaning and using disposable protection more than Nablus clinics (Mean=2.15). These repeated results among all infection control domains confirm Tulkarm's dental clinics are superior over those of Nablus's in terms of commitment to apply infection control measures, this commitment may come from high knowledge among Tulkarm dentists or continuous and frequent inspection of these dental clinics by stakeholders (dental association- Tulkarm branch or (PMH). Significant differences in decontamination and cleaning surfaces and using disposable protection barriers to cover some surfaces among participants attributed to the years of experience variable ″P<0.05″ that has been detected. The Post-Hoc test showed that the group of (>20 years) with a mean=1.83 are the least group applying decontamination and cleaning surfaces and use disposable protection barriers to cover some surfaces among all other groups. This result may indicate that using things for a long time, will make it troublesome and workers who work for many years will become less compliant than others (Kods, Kersly, and Strebler, 1998). There were also significant differences in decontamination and cleaning surfaces and using disposable protection barriers to cover some surfaces among participants attributed to the ownership variable ″P<0.05″. The Post-Hoc test showed that UNRWA dental clinics with mean=1.00 are the lowest group in

applying decontamination compared with other dental clinics this result enforce what we noticed in the hand washing domain that when there is a large number of clients and patients visiting clinic per day (5 working hours). This will lead to drowse in order to disinfect and clean between patients.

5.3.7 Aerosol Control

Many infectious pathogens can be transmitted by accidental inhalation of aerosol contaminated with blood, tissue fluids or saliva contains these infectious pathogens. COVID-19, hepatitis-B, tuberculosis, and AIDS are examples of such infectious diseases transmitted by accidental inhalation of infected splatter and aerosol (Airborne Precautions, 2020). Dental procedures may generate large amounts of contaminated aerosol and splatter by headpiece water and air spray (Sawhney et al., 2015). A rubber dam is one of the many ways that can prevent the spreading of contaminated aerosol during the dental procedure (Al-Amad et al., 2016). The participants of this study showed low compliance regard using rubber dam (31.30%), but they were better than dentists in another study in which the use of the rubber dam in their daily dental practice was only (23.8%) (Sanghvi et al., 2018). Another study in Khartoum State, Sudan revealed that (97.6%) of dentists did not use the rubber dam (Idris, 2012). The low percentage in this study can be because of low knowledge about the importance of such a device. So, a high cost or low knowledge about how to use this device so, a highly concentrated effort should be

made by competent committees' regard using a rubber dam. The High-Volume Evacuator is another method used during dental care procedures to prevent aerosol contamination by suctioning a large amount of blood and saliva that is secreted during headpiece working (Sawhney et al., 2015). The participants of this study showed a high degree of compliance regard using (HVE) with (86.80%), this is a good result comparing with another one in which (28.6%) of public hospitals use high volume evacuation hospitals compared to (19.4%) in academic institutions (Mahasneh et al., 2020). Another study revealed that (61.6%) did not use high vacuum suction (Idris, 2012). The good result may come from the point that (HVE) is connected with a dental chair so the dentist doesn't need to buy such device separately, but there is a need for reinforcing using (HVE) by increasing knowledge. Protective Mouth Rinse (PMR) with (0.2%) chlorhexidine is also another method to prevent the spreading of splatter during dental care procedures. This pre-procedural (PMR) can kill a large number of pathogens that can be splattered during dental procedures (Hendrick, 2020c). A study revealed that (PMR) can reduce the number of pathogens in the dental patient's mouth if they used gargling agents (Choi, Yu-Jin, and Hee Nam, 2018). (47.20%) participants in this study were using this method (PMR) which was a low percentage. In another study, two-thirds of dental practitioners would ask their dental patients to use a (PMR) before starting the treatment (Qamar, Shaikh, and Afzal, 2020). This low percentage in this study may be attributed to the expensive price of such rinse, low knowledge about the use, and the importance of this

method. Although results regard aerosol control in general between participants with (55.1%), this result is very important to be taken into consideration by the competent committees, because, most infectious diseases are transmitted by contaminated air inhalation especially nowadays while we are living the ghost of COVID-19. Significant differences in aerosol control among participants were attributed to the Governorate variable (P-value<0.05). The T-test showed that dental clinics in Nablus district with means=0.51 are lower in applying aerosol control than those of Tulkam with mean=0.61. This result corresponds with explanations of the compliance to infection control measures in this Governorate group. On the other hand, there were significant differences in aerosol control among participants attributed to the years of experience variable ″P<0.05″. The Post-Hoc test showed that the group of (≤5 years) with a mean=0.61 were the higher in applying aerosol control among others. This result also corresponded with an explanation of the instrument sterilization for these years of experience group. Finally, in terms of this domain, there were significant differences in aerosol control among participants attributed to the ownership variable ″P<0.05″. The Post-Hoc test showed that private clinics with mean=0.56 were the highest to apply aerosol control. This may indicate the desire of dental customers to receive their treatment in private clinics, which sometimes contributes to their income. But in the public and UNRWA clinics, any reviewers do not affect their income because there is no payment for treating and the income is constant. So, there is a need to find policy, incentives, and to find an

appropriate way to encourage public and UNRWA employees in order to improve the quality of the service.

5.3.8 Accident Management

Accident management is one of the most important (ICP) that should be done and put into consideration in dental clinics. The first aspect of accident management is having a protocol for dealing with accidents of sharp instruments during dental care procedures. Sharp instruments can be needles, dental props, forceps, scalars...etc. According to CDC protocol regarding this aspect, several steps have to be done after exposure to sharp instruments or needle injuries. This protocol, including many steps beginning with stopping the procedure, washing the affected area immediately with soap or disinfectant and water, using sterile water in case of exposure of mucous membrane (e.g. , , the eye), assessing the depth of injury, then checking the instrument, whether it was contaminated with blood or any body fluids, assessing the risk factors for the patient and the immunity status of the dentist for HBV and finally, taking of prophylaxis in the case of exposure to HBV, HIV, HCV (Abubaka et al., 2018).

(48.70%) of participants in this study have such protocol, to deal with accidents during dental care procedure, this percentage is low compared with another one in which (81.0%) of dentists had a clear protocol for needle stick emergency treatment and other sharps accidents (Mahasneh et al., 2020). The low percentage can be due to low knowledge or low awareness among dentists. The second important aspect of accident

management that was included in this study is having a puncture-resistant container for sharp instruments in the clinic. This sharp instrument that is out of use can cause harm to the dentist, staff, or even to people if the dentist leaves it without care. CDC emphasizes the necessity of having puncture-resistant containers for sharp instruments and needles and sturdy, sealed impervious bags for solid waste contaminated with saliva, blood, or any other body fluids to prevent leakage of the contained fluids during the disposal of it (CDC, 2003). This study shows that a high percentage of the participants (90.60%) have a puncture-resistant container for sharp instruments in their clinics, this result is better compared with another one in which (88.4%) of dentists have puncture-resistant containers for sharp instruments (Mahasneh et al., 2020). The practitioners in this field reflect good knowledge, high awareness toward themselves and other people. According to the CDC, each health care institution should have methods to dispose of its medical waste in the dental clinic (CDC, 2003). This is the third important aspect of accident management included in this study. Mercury, silver, lead, blood, sharps, and chemicals should be managed as hazardous waste to protect the environment from environmental disasters. A very low percentage of participants in this study (24.90%) have methods to dispose of their medical waste, this indicates a very big problem regarding cross-infection transmission for dentists and the community. The reasons for this problem should be dealt with seriously by the competent committees. In another study (81%) of all participants were with non-regulated general medical waste produced within their dental offices, and

the medical waste is disposed of in the general clinic trash (Asiri et al., 2019). The causes of such a problem may be because of low knowledge about the importance of methods to dispose of its medical wastes, no supervision, or high cost of these methods. This study revealed that (55.30%) of the participants complied with accident management, this low percentage put dental practitioners in danger. (84.20%) of participants ask their patients about their medical history this result is better than that in another study in which (52%) of Indian dentists had the habit of taking a medical history for all dental patients (Bommireddy et al., 2016). Although patients will not tell the dentist about the real infectious situation, especially if this infectious disease is (AIDS) which is culturally rejected or (HBV) in which patient think that the dentist will reject the treatment procedure if he knows about his disease. The dentist should ask about the medical history of each patient in many indirect ways to protect himself, his staff, and his clients. According to CDC guidelines, each accident and acute injury in the clinic should be documented, such documentation can play as a key element in a broader effort done by many health care organizations to prevent all sharp-related injuries and the transmission of blood-borne infections (CDC, June 6, 2014). In this way, the dentist can also protect himself. In this study, only (21.30%) of participants do this procedure which reflects a lack of knowledge and skills. Another study revealed that only (33.9%) of HCWs document their injuries (Cui et al., 2018).

The analysis reveals that there are significant differences between male and female groups in favor of the male group in accident management (P-value<0.05). The male with a mean=0.73 is higher in the implementation of accident management than the female with mean=0.64. This is because most of the participants in this study were males (nearly 59%). Also, there are significant differences in accident management among participants attributed to the educational level variable ″P<0.05″. The T-test showed that (GP) with mean=0.73 is more compliant to accident management than specialists with mean=0.60. This is because specialist dentists think that they are experienced enough to deal with all accidents (if they happen), and they are not susceptible to fall in such accidents. As in all domains in this study, there are significant differences in accident management among participants attributed to the Nablus and Tulkarm variable in favor of the Tulkarm district ″P<0.05″. The T-test showed that Tulkarm dental clinics with means=0.76 are more compliant to applying accident management in their clinics than Nablus dental clinics with mean=0.65. The explanation of this may as what has been said in the previous domains. There are significant differences in accident management among participants attributed to the years of experience variable ″P<0.05″. The Post-Hoc test showed that the group of (≤5 years) with mean=0.79 are higher in applying accident management than other groups; the explanation of this result is as what we said in the instrument sterilization domain. Significant differences also are present in accident management among participants attributed to the ownership variable

″P<0.05″. The Post-Hoc test showed that private clinics with means=0.70 are applying accident management more than other clinics (public and UNRWA). This is because the dentist in his private clinic is very careful and keen not to have an accident inside his/her clinic, which may lead to a bad influence on the clinic's reputation and the number of clients as well. While in public and UNRWA clinics, the dentist gets a fixed salary, no strict health system that sues the dentist in case of accidents resulting from negligence and causing harm to the patients, and irresponsibility toward patients and society comes from the lack of knowledge and the lack of awareness. All these factors may reduce the compliance with accident management among public and UNRWA dental clinics.

5.4 Participants Opinions about Enhancement of the Awareness of (ICM)

(96.2%) of the participants suggest that increasing awareness among dentists towards the correct measures of infection control can be achieved by lectures, dental magazines, social media, and regular conferences. In this way, the dentist will keep abreast of all developments in the field of infection control. Another study that has been carried out in Jeddah on another health problem revealed that social media is the major source of knowledge and information (Ibrahim, Alwafi, Sangoof, Turkistani, and Alattasc, 2017). A study done in Lebanon about (ICM) showed that the main source of knowledge and information is social media, followed by

newspapers, television, and magazines (Dagher, Sfei, Abdallah and Majzoub, 2017).

5.5 Conclusion

In conclusion, this study, which was done among dental clinics in Tulkarm and Nablus districts reveals that a critical need for strict adherence and compliance to infection control protocol in Nablus and Tulkarm dentists. Strict adherence to infection control protocol can prevent the transmission of infectious diseases in any health care setting (CDC, 2018). Although this study complied with infection control measures, some aspects of important issues have not been covered. For example, the quality of the drinking water from dental units used in Nablus and Tulkarm districts, sterilization of dental impressions after coming from the laboratory, and others of those aspects that have been accorded attention to, we identified some problems in many areas to improve compliance with infection control recommendations in Nablus and Tulkarm districts. There is a need to enhance the skills and knowledge among dental practitioners on the risks and ways of disease transmission in dental care settings. Most of the participants seem to be immunized against HBV (90.60%), but of (69.40%) dental staff needs more awareness to take such immunization. Gloves are worn during the treatment procedure by a high percentage of practitioners (97.70%) and are discarded after each task (97.30%), masks are worn by (77.70%) of the practitioners. A protective eyewear is worn by (74.30%). Although (94.00%) of practitioners use autoclaves, (42.30%) of

them do chemical evaluation for an autoclaving cycle and only (28.30%) do the biological evaluation. Chemical and biological evaluation are very important routine procedures that verify the office sterilizer to help assure patient protection. Evaluation should be used to check for a proper sterilization process. Although hand washing is performed, hand wash is not replaced with alcohol hand rub when hands are visibly clean with (55.10%), and the dental instruments are not cleaned using an ultrasonic cleaner with (21.00%). Most of the participants admitted that they did not use heat sterilization for headpieces (autoclaving) as (36.20%) use it. Many of them were satisfied when cleaning them with alcohol among all patients (90.60%). Also, just (55.10%) of practitioners use heat sterilization for burs (autoclaving), and (57.00%) of them use autoclave endodontic fills. Nearly, half of the dental practitioners are not highly adhered to aerosol control measures (55.1%), two-thirds of them don't use a rubber dam because of low knowledge or high cost, and only (47.20%) of them use (PMR). (24.90%) of dentists don't have methods to dispose of medical wastes in their clinics, one-third of them do not document accidents and acute injuries in their clinics, and (48.70%) of them also do not have a protocol for accidents with sharp instruments in the clinic. This reflects a problem regard accident management issues among dentists in Nablus and Tulkarm districts.

The goal of the infection-control program is to prevent the risk of dental-care associated with infections in dental patients and occupational exposures in dental care providers, which leads to providing a safe

treatment environment for the dental patient and a safe working environment for the dental care workers. Program evaluation is the best way to ensure that (ICM) is useful, accurate, feasible, and ethical. It is important to monitor and evaluate the program to enhance the effectiveness of the infection control, prevention, and dental practice protocols. This evaluation program should be integrated into the day-to-day dental office management to ensure the effectiveness of the infection prevention and control program.

A successful infection control protocol depends on developing routine documentation of adverse outcomes, standard operating procedures, evaluating practices, and monitoring healthcare-associated infections in patients.

When the dentist detects any problems in the implementation of the infection-control protocol in his dental clinic, further evaluation and estimation are needed to solve the problems. Effective implementation of infection control protocol is in an ongoing process, requiring the practitioner to stay current with new knowledge and emerging infectious disease.

Knowledge and recommendations will continue to evolve. Dental practitioners are asked to stay adhered to the latest standards and continually evaluate their infection control protocol and policies to ensure a safe dental practice that protects themselves, their patients, and staff.

5.6 Recommendation

This research highlights the lack of compliance regarded to infection control protocol, especially in Nablus dental clinics. Also, it highlights the need for more education about infection control measures which starts at dental schools and is followed through after graduation with dental conferences, medical courses, or continuing professional development. According to the results of this research, the dental sector in Nablus and Tulkarm needs a national infection control protocol to be improved using current international guidelines that are adapted to the needs of the region and country. It is anticipated that the results of this study will provide some of the required information to improve such national standards.

Many recommendations at several levels are pointed.

Palestinian Ministry of Health (PMH) Level

1. The infection control committee has to be established to plan, monitor and control, and also evaluate the infection control measures in oral health care settings (private and public clinics). This suggested committee will also be responsible for improving, developing, and updating infection control strategies and standards, identifying training course's needs, and establishing training modules taking into consideration COVID 19 pandemic.

2. Periodic surveys have to be undertaken and regular checkups to make sure that the skills and knowledge of OHCWs are preserved, to discover

any weaknesses, and to prepare the training courses according to the obtained findings. This may enhance the awareness of the importance of infection control measures among OHCWs.

3. An infection control department should be created in all health care settings in all of the districts of Palestine.

4. Obligatory and formal training should be provided (initial and ongoing) in infection control protocol for all dental practitioners and their assistants with the mandatory instructions to improve their skills and knowledge toward the implementation of the infection control protocol.

5. The infection control guidelines manual has to be disseminated for dental practices developed by the Palestinian Ministry of Health, and this manual should be available to Nablus and Tulkarm dental clinics.

6. (PMH) should encourage specialization of infection control by providing scholarships in the major of infection control, by this way (PMH) will create many specialists in the infection control field.

Hospitals and dental settings level

1. Providing post-immunization test (s) for (OHW) in dental clinics, and offering regular check-up (s) for (OHCW) to guarantee they are free from any infectious diseases.

2. The administrative department of the hospitals and dental settings must offer patient records which are considered as one of the main basic steps

of effective implementation of infection control protocol, (this procedure will help to identify infection sources, where, when, and how a patient is treated is very necessary to achieve this goal).

3. Paying attention to training, consulting, workshops, and providing the necessary instruments, supplements, and materials to the clinics to prevent re-using of the same instruments and material.

Patient-level

Patients must be honest in clarifying their current health status. They must be encouraged to do that in any health care setting, to prevent the transmission of infectious diseases to the staff and other patients. The correct patient's medical history must be taken regularly by the dentists because this way will increase the awareness of diseases and the appropriate medication which might interfere with the dental treatment procedure of the patient.

General Recommendation

1. In future studies, the inclusion of other districts (other than Nablus and Tulkarm) to evaluate infection control measures would certainly allow a greater understanding of the infection control status and lead to more basic findings.

2. Evaluation of an actual infection control protocol by sampling tools, instruments, and surfaces and culture them and check their disinfection and sterilization status.

3. Evaluation of patient’s confidence and perception of dental clinics regard infection control practices.

4. Evaluation of infection control protocol at other parts of health care offices, especially maternity units and general medical clinics in the public and private health sector.

5. More concentration on E-learning by (PMH), hospitals, dental sittings and dental branches in each Governorate, about the updated knowledge of (ICM).

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APENDIX (1)

وزارة الصحة الفلسطينية
وحدة صحة الفم والأسنان
تلفاكس: 02-2417072

الإدارة العامة للرعاية الأولية
مديرية صحة: .....
تلفاكس: .....

نموذج الكشف على عيادات الاسنان

لإعطاء التراخيص السنوية

المحافظة :_____

اسم الطبيب:_____ رقم الهويه:_____

سنة التخرج:_____ اسم الجامعة : _____ البلد :_____ التخصص : _____

رقم عضوية النقابة : _____ تاريخ مزاولة المهنة: _____

رقم الهاتف عيادة : _____ المنزل : _____ نقال: _____

عنوان العيادة: _____

نوع العيادة: خاص ☐ اهلية ☐ وكالة ☐

اسم المؤسسة :_____ عدد ايام العمل بالعيادة في الاسبوع :_____

ساعات العمل اليومية : من :_____ الى _____

اذا كان يعمل في مكان اخر "حدد": _____

[illegible] ☐ لا ☐

لوحة الطبيب قانونية ☐ نعم ☐ لا

اوراق الطبيب قانونية ☐ نعم ☐ لا

بطاقات المرضى ☐ متوفرة ☐ غير متوفرة

ملف ضريبي ☐ متوفرة ☐ غير متوفرة

التطعيم ضد مرض التهاب الكبد الوبائي للطبيب ☐ تاريخ اخر جرعة : _____

[illegible]

مساحة العيادة:_____ عدد الغرف: _____ غرفة طبيب : _____ غرفة انتظار : _____

الإضاءة: _____ التهوية: _____

نظافة العيادة: ☐ جيدة ☐ متوسطة ☐ سيئة

طرق التخلص من الادوات الطبية المستعملة: ☐ حرق ☐ رمي بالنفايات العامة
طرق اخرى :_____

اسم الدورة	مدة الدورة	مكان الدورة	تاريخها

الرقم	اسم الطبيب	اسم الموقف	الشهادة	الوظيفة	التطعيم" H.B
١.					
٢.					
٣.					
٤.					

الإضاءة ☐ تعمل بصورة جيدة ☐ لا تعمل

الكرسي ☐ يعمل بصورة جيدة ☐ لا يعمل

الفيضات ☐ تعمل بصورة جيدة ☐ لا تعمل

الضغط ☐ جيد ☐ ضعيف

النباء ☐ جيدة ☐ سيئة

ماصات اللعاب ☐ تعمل ☐ لا تعمل

جهاز التعقيم: ☐ رطب ☐ جاف نوعه.....

جهاز الاشعة: ☐ يوجد ☐ لا يوجد نوعه.....

واقي الاشعة: ☐ للطبيب ☐ للمريض ☐ غير موجود

جهاز تنظيف الأسنان: ☐ يعمل ☐ لا يعمل ☐ غير موجود

جهاز التصاب الصوتي: ☐ يعمل ☐ لا يعمل ☐ غير موجود

جهاز الملغم: ☐ يعمل ☐ لا يعمل ☐ غير موجود

APENDIX (2)

Ministry of Health
Primary Health Care General Directorate
Tulkarm Governorate Health Directorate

دولة فلسطين
وزارة الصحة
الإدارة العامة للرعاية الصحية الأولية
مديرية صحة محافظة طولكرم

Ref.: KDDQC19038

التاريخ: 2019/05/09

تعقيم الادوات في عيادة الأسنان

1. لبس الملابس الواقية (مريول وكفوف)
2. نقع الأدوات بسائل مطهر هيبوكلوريت الصوديوم 5% , ويحضر بالطريقة التالية ولمدة 10 دقائق.
   1- في حال وجود أقراص كلور يتم حلها حسب تركيز الأقراص حسب الجدول التالي :

500 mg	1500 mg	2500 mg
5 tab to ,5 litre water	5tab to 1.5 litre water	5tab to 2.5 litre water

2- في حال وجود كلور سائل تركيز 12%
يحل كاسة واحده في 23 كاس ماء للحصول على التركيز المطلوب 5%,
3- غسل الأدوات جيدا من الكلور وتنشيفها.
4- تغليف الأدوات مع فتح الادوات المفصلية ووضعها بالاتوكليف حسب تعليمات تشغيل الاتوكليف.
5- تحفظ الأدوات المعقمة في مكان مغلق ونظيف ولا يجوز فتح اكياس التعقيم الا عند الاستعمال ويجب تدوين أسم الشخص الذي قام بالتعقيم وتاريخ التعقيم.
6- الادوات المعقمة بدون استعمال تبقى معقمة لمدة 3 شهور شريطة أن تبقى بالغلاف وان لا يفتح.
7- تعقيم الأسطح والكرسي بمسحها في الكلور 5%, بعد كل مريض.

Ministry of Health
Primary Health Care General Directorate
Tulkarm Governorate Health Directorate

وزارة الصحة
الإدارة العامة للرعاية الصحية الأولية
مديرية صحة محافظة طولكرم

Ref.: KDDQC18004

التاريخ: 2018/08/30

تعليمات تشغيل جهاز التعقيم steris

1- تنظيف الجهاز يوميا بقطعة قماش مبلولة أو رطبة.
2- التأكد من منسوب الماء بحيث يكون اقل من max و أعلى من refill.
3- التأكد من عدم وجود مياه داخل الجهاز مكان التعقيم.
4- وضع المواد المراد تعقيمها.
5- تشغيل الجهاز من مفتاح التشغيل خلف الجهاز.
6- إغلاق الباب بشكل محكم.
7- اختيار برنامج التعقيم 121 سيلسيوس و30 دقيقة مدة التعقيم أو 134 سيلسيوس لمدة 15 دقيقة.
8- الضغط على كبسة التشغيل على اللوحة الأمامية.
9- تفقد الجهاز بين فترة وأخرى للتأكد من عدم وجود خلل
10- قراءه الحرارة في مرحلة التعقيم وتسجيلها
11- بعد الانتهاء من فترة التعقيم والتجفيف يفتح الباب فتحة بسيطة ويترك لمدة نصف ساعة
12- تعبئة نموذج التعقيم
13- عند أخراج الأدوات من الجهاز يجب فحصها والتأكد من سلامتها واي كيس مبلول ورطب يعاد للتعقيم من جديد

المهندس عبد الرحيم سنينه

Date: 30/8/2018
Send: 4

APENDX (3)

سياسة مكافحة وضبط العدوى في عيادات الفم والاسنان

1- الهدف :-

الالتزام بسياسة مكافحة وضبط العدوى عند التعامل مع المريض يمنع نقل العدوى المرتبطة بتقديم الرعاية الصحية من والى المريض.

2- المتطلبات العامة:-

- ✓ الالتزام بلبس اللباس الواقي
- ✓ التنظيف والتطهير بين كل مريض وآخر
- ✓ تبديل الأدوات بين المريض والأخر
- ✓ لبس الكفوف أثناء العمل وتغييرها من مريض لآخر
- ✓ غسل الأيدي قبل البدء بالعمل وبين المرضى
- ✓ استخدام الأساليب المعقمة بالتعامل مع المرضى
- ✓ التطعيم ضد التهاب الكبد ب ومراجعه مديرية الصحة في حال تم التعرض للوخز بأدوات حادة
- ✓ توفر كمامات من النوع الذي لا ينفذ الرذاذ عند وجود الرذاذ أو المريض مصاب بمرض السل
- ✓ يجب توفر صندوق الأمان للتخلص من الأدوات الحادة ويمكن الحصول عليه من مستودع الأدوية بمديرية صحة طولكرم
- ✓ يجب أن تكون هناك حاوية للنفايات الطبية بجانب كرسي الأسنان سهل الوصول إليها
- ✓ وجود الكحول جل في العيادات
- ✓ وجود جهاز التعقيم البخاري autoclave

3- الإجراءات الوقائية أثناء العلاج :-

1. وضع الأدوات الضرورية فقط في منطقة العلاج
2. ترتيب الأدوات حسب الاستعمال وعلى أن تكون معقمة
3. استخدام رؤوس الحفر المعقمة وتغييرها من مريض لأخر
4. تجنب فتح أو لمس الأدراج والخزائن أثناء علاج المريض

5. عند الانتهاء من الجلسة تعتبر كل الأسطح ملوثة بحاجة لتعقيم تنظف الكرسي بهيبوكلوريت 1000جزء بالمليون وكذلك جميع السطوح والمقابض
6. يجب تغطية الابره باليد الواحدة أو عدم الثني كسر السن نهائيا
7. يتم تمرير الماء الجاري لعدة دقائق في بداية اليوم وبين مريض وأخر
8. يتم تمرير الماء والهواء لمده 20-30 ثانية بعد كل استخدام وبين مريض وأخر
9. عند حدوث انسكابات دموية نضع عليها هيبوكلوريت 5000 جزء بالمليون لمده عشر دقائق وتغطى بورق ماص أو قطعة قماش ثم تزال عن الأرض وثم تنظف بمادة منظفه.
10. تعقيم الأدوات المستعملة

1. يجب أن توضع بسائل مطهر لمنع جفافها وتقليل التلوث
2. تنظف بفرشاة للتخلص من بقايا الدم والأنسجة بعد النقع
3. تجفيف الأدوات باستخدام قماش نظيف
4. تغليف الأدوات ووضعها بجهاز الاوتوكليف وتسجيل تاريخ التعقيم عليها وقت التعقيم يكون حسب درجة الحرارة 121درجة منوية وضغط 1 بار لمدة 50 دقيقة أو 134 درجة منوية وضغط 1 بار و لمدة 20 دقيقة , المواد غير المستعملة يعاد تعقيمها بعد 14 يوم من التعقيم ويجب التأكد من تغير لون المؤشر الكيميائي على كيس التعقيم للتأكد من اكتمال دورة التعقيم.
5. الأدوات التي تتأذى بوضعها بالاوتوكليف تعقم باستخدام جلوتارالدهايد (سايدكس) بتركيز ووقت حسب تعليمات الشركة الصانعة.

11. تعقيم التوربين يجب تفريغه من الماء الموجود بداخله وهو متصل بالجهاز لمدة 30 ثانية وعلى أن يتم تنظيفها بمطهر.
12. القياسات والطبعات المرسلة للمختبر يجب غسلها من بقايا الدم بواسطة الماء الجاري ووضعها بكيس محكم الإغلاق وكذلك بالنسبة للخز عات والمسحات.

APENDIX (4) A

الزملاء أطباء الأسنان المحترمين

تحية طيبة و بعد،

تقوم "د.أريج صباح" طبيبة الأسنان و طالبة الدراسات العليا في كلية الطب وعلوم الصحة في جامعة النجاح الوطنية الوطنية باجراء دراسة بعنوان " مكافحة انتقال العدوى في عيادات الاسنان في محافظتي نابلس وطولكرم".

تهدف من خلالها الى تسليط الضوء على ممارسات مكافحة انتشار الامراض المعدية في عيادات الأسنان من خلال تعبئة الاستبيان المرفق وبالتالي تحديد فيما اذا كانت عيادات الأسنان في الضفة الغربية بحاجه الى اهتمام اكبر من قبل وزارة الصحة من حيث الدعم بدورات تثقيفيه او برامج تدريبيه للطبيب ام لا. يحتوي الاستبيان على (63) سؤال يتوجب على الطبيب أن يجيب عليها جميعا بمسؤولية عالية، علما أن الاجابة على الاستبانة لا تتجاوز الـ (15) دقيقة.

زملائي الأفاضل،

أنني في هذه الدراسة أعد الطبيب بالسرية التامة حيث ان الدراسة لا تشمل ذكر اسماء ولا عناوين عيادات ولا ارقام هواتف. و أعلمكم أنني حصلت على الأيميل الخاص بحضرتكم من مقر النقابة التابع لمحافظتكم.

فاذا كنت موافق/ة على المشاركة في هذه الدراسة، أرجو منك ان تقوم بالإجابة على الاسئلة بمنتهى الشفافية والصدق وارسال الإجابة عبر الايميل areejsabbah83@gmail.com أو تسليمها بشكل مباشر حسب التنسيق حتى نتمكن من تقييم الوضع السائد في فلسطين بخصوص مكافحة انتقال العدوى في عيادات الأسنان والعمل على مساعدة الجهات المختصة لأخذ التدابير المناسبة حتى نرتقى بصحتنا وصحة مجتمعنا.

ملاحظة: سوف نقوم بإعادة ارسال الاستبيان عبر الايميل مره اخرى خلال اسبوع في حال تأخر الرد. لكم جزيل الشكر

استبيان حول مكافحة انتقال العدوى في عيادات الأسنان في محافظتي نابلس وطولكرم

القسم الأول: لطفا أجب عن الأسئلة المتعلقة بالخصائص الديمغرافية لأطباء الأسنان

1. الجنس: أ. □ ذكر ب. □ انثى
2. نوع الممارسة: أ. □ طبيب أسنان عام ب. □ اخصائي
3. المحافظة: أ. □ نابلس ب. □ طولكرم
4. سنوات الخبرة:أ. □ ≥ 5 ب. □ 6-10 ج. □11-15 د.□16-20 ه. 20 ≤ □
5. مكان العمل: أ. □ عيادة خاصة ب. □ عيادة حكومية ج. □ عيادة اونروا

القسم الثاني: مصادر المعلومات حول الأمراض المعدية:

يرجى وضع إشارة (□) في المربع الذي يتفق مع رأيك، أمام كل فقرة من الفقرات الآتية:

1. مصدرالمعرفة حول مكافحة العدوى	1. □ كليات طب الاسنان 2. □ اجتماعات علمية و دورات 3. □ دراسات عليا 4. □ مجلات طب الاسنان 5. □ مصادر اخرى

القسم الثالث: مدى معرفة و اعتقاد طبيب الأسنان حول انتقال الأمراض المعدية:

يرجى وضع إشارة (✓) في المربع الذي يتفق مع معرفتك و اعتقاداتك، أمام كل فقرة من الفقرات الآتية:

الرقم	الفقرات	نعم	لا
.1	هل تعتقد انك بحاجة الى تعلم المزيد عن اجراءات منع انتشار العدوى		
.2	هل تعتقد ان العدوى يمكن ان تنتقل اثناء ممارسة علاج الاسنان		
.3	هل تعتقد ان العدوى يمكن ان تنتقل عن طريق الرش والرذاذ (SPLATTER/SPLASH).		
.4	هل تعتقد ان العدوى يمكن ان تنتقل عن طريق الجلد		
.5	يمكن ان نعتبر أن مرض AIDS من اهم الأمراض المعدية في عيادات الاسنان		
.6	أعتقد ان جميع الميكروبات المسببة للأمراض تحتاج الى سطح صلب للانتقال		
.7	اعتقد ان التطعيم هو الطريقة الاكثر قابلية للتنبؤ بها لمنع انتشار التهاب الكبد الوبائي		

القسم الرابع: ممارسات النظافة الشخصية واستخدام معدات الوقاية الشخصية:

يرجى وضع إشارة (✓) في المربع الذي يتفق مع ممارستك في العمل، أمام كل فقرة من الفقرات الآتية:

الرقم	الفقرات	دائما	فيبعض الأحيان	لا افعل ابدا
1.	أقوم بغسل اليدين قبل البدء في عملية العلاج وبعد الانتهاء منها			

الرقم	الفقرات	دائما	في بعض الأحيان	لا افعل ابدا
2.	أقوم بغسل اليدين عند ملامسة الغشاء المخاطي, الدم, أو أي سوائل من المريض			
3.	أقوم باستبدال غسل اليدين بفركها بالكحول اذا لم نلاحظ وجود أوساخ عليها			
4.	أقوم بارتداء الكفوف الطبية اثناء عملية العلاج			
5.	أقوم بالتخلص من القفازات بعد الانتهاء من الاجراء العلاجي			
6.	أقوم باستخدام غطاء للراس			
7.	أقوم بارتداء اثواب واقية يمكن التخلص منها بعد انهاء عمليات جراحية			
8.	أقوم بارتداء نظارات واقية			
9.	أقوم بارتداء قناع واقي أثناء العمل			
10.	يتم تغيير الكفوف بين المريض والآخر			
11.	أقوم بارتداء المعطف الأبيض أو أي بدله مخصصه للعمل داخل العيادة			
12.	أقوم بغسل اليدين بعد الانتهاء من عملية العلاج باستخدام غسول يدوي مضاد للجراثيم			
13.	أقوم بلبس القفازات والملابس الواقية أنا و جميع العاملين في عيادة الاسنان			

القسم الخامس: مراقبة الهباء الجوي AEROSOL CONTROL:

يرجى وضع إشارة (✓) في المربع الذي يتفق مع ممارستك في العمل ، أمام كل فقرة من الفقرات الآتية:

الرقم	الفقرات	نعم	لا
1.	أقوم باستخدام الحاجز المطاطي Rubber Dam		
2.	أقوم باستخدام ماص اللعاب ذو قوة شفط عالية HighVolume Evacuator		
3.	أقوم باستخدام المضمضة الوقائية قبل البدء بالعلاج Protective Mouth Rinse		

القسم السادس: ادارة الاصابات الحادة والتدابير الوقائية المتبعة في عيادات الاسنان في محافظتي نابلس و طولكرم :

يرجى وضع إشارة (✓) في المربع الذي يتفق مع ممارستك في العمل، أمام كل فقرة من الفقرات الآتية:

الرقم	الفقرات	نعم	لا
1.	حدث جرح بآلات حادة خلال العام الماضي		
2.	لدي بروتوكول واضح للتعاطي مع الاصابات الحادة		
3.	لدي حاويات خاصه مقاومة للثقب للتخلص من المخلفات الحادة		
4.	أقوم بتوثيق مثل هذه الحوادث التي من الممكن ان تحصل		
5.	لدي طريقة للتخلص من النفايات الطبية من خلال شركات خاصة		
6.	أقوم باخذ التاريخ الطبي والمرضي للمريض		
7.	تم تطعيمي كطبيب الاسنان ضد التهاب الكبد الوبائي		
8.	تم تطعيم العاملين في عيادتي ضد التهاب الكبد الوبائي.		
9.	كطبيب اسنان لدي الحق في رفض علاج اي شخص مصاب بالتهاب الكبد الوبائي		

القسم السابع: طرائق التنظيف والتعقيم والتطهير في عيادات الأسنان:

يرجى وضع إشارة (✓) في المربع الذي يتفق مع ممارستك في العمل ، أمام كل فقرة من الفقرات الآتية:

الرقم	الفقرات	نعم	لا
.1	أقوم بتنظيف الادوات المستخدمة عبر الغسيل اليدوي		
.2	أقوم بتنظيف الادوات المستخدمة عبر منظف بالموجات فوق الصوتية		
.3	أقوم بتنظيف الادوات المستخدمة عبر الغسيل بالمعقم		
.4	أغمرالادوات المستخدمة في محلول التطهير قبل الغسيل		
.5	أغمر الادوات المستخدمة في محلول التطهير بعد الغسيل		
.6	أقوم بتطهير الطبعات قبل ارسالها الى المختبر		
.7	أستخدم التعقيم بواسطة الاوتوكليف		
.8	أستخدم التعقيم بواسطة الحرارة الجافة		
.9	استخدم التعقيم الحراري للأدوات اليدوية		
.10	استخدم التعقيم الحراري لـ handpieces		
.11	استخدم المعقم الحراري لـ Burs		
.12	استخدم التعقيم الحراري لساحبات العصب وادوات المعالجة اللبية Endodontic Files		
.13	استخدم اكياس التغليف للأدوات المعقمة		
.14	استخدم مطهر لـHandpieces بين المريض والاخر		
.15	أنا على علم بكيفية فحص كفاءة ال Autoclave		
.16	أقوم بفحص كفاءة الـ Autoclave باستخدام المؤشر الكيميائي في كل دورة		
.17	أقوم بفحص كفاءة الـ Autoclave باستخدام المؤشر البيولوجي مره كل اسبوع على الاقل		
.18	كطبيب أسنان أترك فاصل زمني بين المريض والأخر على كرسي الاسنان نفسه مدة 5 دقائق فأقل		
.19	كطبيب أسنان أترك فاصل زمني بين المريض والآخر على كرسي الاسنان نفسه ما بين 6-15 دقيقة		
.20	كطبيب أسنان أترك فاصل زمني بين المريض والآخر على كرسي الاسنان نفسه أكثر من 15 دقيقة		

القسم الثامن: تغطية السطوح بحواجز عازله واستخدام مطهر للسطوح:

يرجى وضع إشارة (✓) في المربع الذي يتفق مع ممارستك في العمل ، أمام كل فقرة من الفقرات الآتية:

الرقم	الفقرات	دائما	في بعض الأحيان	لا اقوم بهذا العمل ابدا
1.	أقوم بتغطية الأسطح التي يصعب تعقيمها			
2.	أقوم بتغليف الLight Cure بأكياس			
3.	أقوم باستخدام الحواجز(القابلة للرمي) لتغطية الأسطح الخاصة بكرسي الأسنان			
4.	أقوم بالتخلص من الحواجز(القابلة للرمي) المستخدمة لتغطية الأسطح بعد الانتهاء من العلاج			
5.	أقوم باستخدام أي مطهر لمسح الأسطح التي لا تلامس المريض بين المرضى			

القسم التاسع:

برايك كيف يمكننا ان نزيد من وعي أطباء الأسنان في طرق مكافحة العدوى داخل عيادات الأسنان في محافظتي نابلس و طولكرم؟

APPENDIX (4) E

Fellows, respected dentists;

Greeting,

Dr. Arij Sabah, a dentist and a graduate student from the Faculty of Medicine and Health Sciences at An-Najah National University, is conducting a study entitled "**Cross-Infection and Infection Control in Dental Clinics in Nablus and Tulkarm Districts**." This study aims to highlight the practices of combating the spread of infectious diseases in dental clinics by filling out the attached questionnaire and thus determining whether dental clinics in the West Bank need more attention from the Ministry of Health in terms of support with educational courses or training programs or not. The questionnaire contains (63) questions that the doctor must answer all of them with high responsibility, knowing that answering the questionnaire questions does not exceed (15) minutes. My respected colleagues, in this study I pledge the doctor strictly as the study does not include mentioning names, clinic addresses or telephone numbers. I have obtained your e-mail from your district's union headquarters. If you agree to participate in this study, please answer the questions with utmost transparency and honesty, then send the answer via this email: areejsabbah83@gmail.com. Or deliver it directly according to coordination, so that we can assess the situation in Palestine regarding the control of cross infection in dental clinics and work to help the competent authorities to take appropriate measures, so that we can improve our health and the health of our society.

Note: We will resend the questionnaire via email again within a week in case the reply is delayed.

Thank you very much.

Questionnaire: Cross Infection Control in Dental Clinics in Nablus and Tulkarm Governorates

Section 1: Could you kindly answer the following questions about the demographic characteristics of the dentists, please?

1.**Sex:** A. Male B. Female

2.**Practice type:** A. General Dentist B. Specialist

3.**Province:** A. Nablus B. Tulkarm

4.**Years of experience:** A. ≤ 5 B. 6-10 C. 11-15 D. 16-20 E. ≥ 20

5.**Workplace:** A. Private clinic B. Government clinic C. UNRWA clinic

Section 2: Sources of information on infectious diseases:

Please place (✓) in the box that agrees with your opinion, in front of each of the following paragraphs:

1.Source of knowledge about infection control	A. Dental Colleges □ B. Meetings and courses □ C. Graduate Studies □ D. Journals □ E. Other sources □

Section 3: The extent to which the dentist knows and believes in the transmission of infectious diseases:

Please place (✓) in the box that agrees with your knowledge and beliefs, in front of each of the following paragraphs:

No.	Paragraphs	Yes	No
1.	Do you think that you need to learn more about infection prevention measures?		
2.	Do you think that the infection can be transmitted during the dental treatment?		
3.	Do you think that the infection can be transmitted by spray and spray? (SPLATTER/SPLASH)).		
4.	Do you think that the infection can be transmitted through the skin?		
5.	We can consider AIDS as one of the most important infectious diseases in dental clinics.		
6.	I think all pathogenic microbes need a hard surface to move.		
7.	I think vaccination is the most predictable way to prevent the spread of hepatitis.		

Section 4: Hygiene practices and the use of personal protective equipment:

Please place (✓) in the box that agrees with your practice in front of each of the following paragraphs:

No.	Paragraphs	Always	Sometimes	I never do
1.	I wash my hands before and after treatment.			
2.	I wash hands when touching the mucous, blood and any fluids from the patient.			
3.	I replace the hand washing with rubbing alcohol if we don't notice any dirt on them.			
4.	I wear medical gloves during the treatment.			
5.	I get rid of the gloves after the treatment is done.			
6.	I use a head cover during the work.			
7.	I wear protective gowns that can be disposed of after the surgery.			
8.	I'm wearing goggles during the work.			
9.	I wear a protective mask at work.			
10.	I change the paws between the patient and the other.			
11.	I wear a white coat or any suit for work inside the clinic.			
No.	Paragraphs	Always	Sometimes	I never do
12.	I wash my hands after the treatment is completed with an antibacterial hand wash.			
13.	I wear gloves and protective clothing as well as all the dental staff.			

Section 5: Aerosol control:

Please place (✓) in the box that agrees with your practice, in front of each of the following paragraphs:

No.	Paragraphs	Yes	No
1.	I use the rubber dam.		
2.	I use a high-volume suction.		
3.	I use protective mouth rinse before starting treatment		

Section 6: Management of acute injuries and the preventive measures in place in the dental clinics in Nablus and Tulkarm Governorates:

Please place (✓) in the box that agrees with your practice, in front of each of the following paragraphs:

No.	Paragraphs	Yes	No
1.	There has been a sharp machined wound over the past year.		
2.	I have a clear protocol for dealing with acute injuries.		
3.	I have special puncture-resistant containers to get rid of sharp waste.		
4.	I am documenting such incidents that could happen.		
5.	I have a way to dispose the medical waste through private companies.		
6.	I am taking the patient's medical and medication history.		
7.	I was vaccinated as a dentist against hepatitis B.		
8.	My clinic staff have been vaccinated against hepatitis B.		
9.	As a dentist, I have the right to refuse treatment for anyone with hepatitis B.		

Section 7: Cleaning, sterilization and disinfection methods in dental clinics:

Please place (✓) in the box that agrees with your practice, in front of each of the following paragraphs:

Number	Paragraphs	Yes	No
1.	I clean the tools used through manual washing.		
2.	I clean the tools used by an ultrasonic cleaner.		
3.	I clean the tools used by washing them with sterilizer.		
4.	I immerse the tools used in the disinfection solution before washing.		
5.	I immerse the tools used in the disinfection solution after washing them.		
6.	I disinfect the prints before sending them to the lab.		
7.	I use autoclave sterilization.		
8.	I use dry heat sterilization.		
9.	I use thermal sterilization for hand tools.		
10.	I use thermal sterilization for HANDPIECES.		
11.	I use thermal sanitizer for BURS.		
12.	I use thermal sterilization for nerve pullers and ENDODONTIC FILES.		
Number	Paragraphs	Yes	No
13.	I use packaging bags for sterilized tools.		
14.	I use hand pieces disinfectant between one patient and another.		
15.	I am aware of how to check autoclave efficiency.		
16.	I check autoclave efficiency by using the chemical indicator in each cycle.		
17.	I check autoclave efficiency by using the biomarker at least once a week.		
18.	As a dentist, I leave a time interval between the patient and the other on the dental chair itself for five minutes or less.		

19.	As a dentist, I leave a time interval between the patient and the other on the dental chair it self between 6-15 minutes.		
20.	As a dentist, I leave a time interval between the patient and the other on the dental chair itself for more than 15 minutes.		

Section 8: Covering surfaces with insulating barriers and using disinfectant for surfaces:

Please place (✓) in the box that agrees with your practice, in front of each of the following paragraphs:

No.	Paragraphs	Always	Sometimes.	I never do this practice.
1.	I cover the surfaces that are difficult to be sterilized.			
2.	I wrap the light cure with raps.			
3.	I use throwable barriers to cover the surface of the dental chair.			
4.	I get rid of the throwable barriers used to cover the surfaces after the treatment is completed.			
5.	I use any disinfectant to wipe the surfaces that are not in contact with the patient between patients.			

Section 9:

How can we increase the awareness of dentists toward infection control methods within dental clinics in Nablus and Tulkarem Governorates?

Appendix (5)

An-Najah
National University
Health Faculty of medicine&
Sciences
IRB

جامعة النجاح
الوطنية
كلية الطب وعلوم الصحة
لجنة اخلاقيات البحث العلمي

Ref : Mas June /20/9

IRB Approval Letter

Study Title:

"Cross-Infection And Infection Control In Nablus And Tulkarm Districts"

Submitted by:
Areej Sabbah

Supervisor:
Wafaa Menawi , Lubna Alkharaz

Date Approved:
24th June 2020

Your Study Title **"Cross-Infection And Infection Control In Nablus And Tulkarm Districts"** was reviewed by An-Najah National University IRB committee and was approved on **24th June 2020.**

Hasan Fitian, MD ,

IRB Committee Chairman
An-Najah National University

IRB

جامعة النجاح الوطنية

كلية الدراسات العليا

مكافحة انتقال العدوى في عيادات الاسنان في محافظتي نابلس وطولكرم

إعداد

أريج بسام الصباح

إشراف

د. وفاء مناوي

د. لبنى الخراز

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في برنامج إدارة الصحة العامة، بكلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.

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الملخص

الخلفية: شهدت مكافحة العدوى العديد من التطورات في السنوات الماضية، لا سيما في جائحة كوفيد 19، وعلى الرغم من ذلك، هناك العديد من المضاعفات في مرافق الرعاية الصحية المختلفة وكذلك طبيعة عمل عيادات أطباء الأسنان بسبب نقص المعرفة بمكافحة العدوى وفشل الامتثال بها.

الهدف: هو تقييم مستوى المعرفة والاتجاه والامتثال المتعلقة بتدابير مكافحة العدوى في عيادات طب الأسنان العامة والخاصة في منطقتي نابلس وطولكرم، فلسطين.

الطريقة: تم استخدام عينة عالمية لتقييم برنامج مكافحة العدوى في عيادات الأسنان في محافظة نابلس وطولكرم. لقد تم التخطيط لإجراء الدراسة في ظل الظروف الصحية الطبيعية‘ ولكن بسبب جائحة كورونا 19 في فترة جمع المعلومات فان هذه الدراسة قد تأثرت في هذه المرحلة الصعبة. حيث عكست الدراسة مدي الالتزام بتدابير مكافحة العدوى في عيادات الاسنان في فترة جائحة كورونا 19. شملت عينة الدراسة على 265 طبيب أسنان. تم جمع البيانات باستخدام استبيان تم إرساله عبر البريد الإلكتروني بين شهري تموز وآب 2020. أجريت دراسة تجريبية على عينة عشوائية من 20 طبيب أسنان من منطقة جنين بعد الحصول على الإذن. ولقد تم استخدام الإحصاء الوصفي واختبار **Chi-square** واختبار **ANOVA** أحادي الاتجاه واختبار **Post-Hock**. تم تعيين الدلالة الإحصائية عند " **P <0.05** ". بالإضافة الى إجراء اختبار كرونباخ ألفا والصلاحية الداخلية لضمان موثوقية وصحة الاستبيان.

النتائج: شملت عينة الدراسة 265 طبيب أسنان. فيما يتعلق بالخصائص الديموغرافية للمشاركين، فإن ثلثي العدد الإجمالي لحجم العينة هم من الذكور، وشكلت نسبة الممارس العام من حيث مستوى التعليم (75.1٪) من حجم العينة الكلي كما شكل المشاركون من مدينة (نابلس) (56.2٪). اتسم المشاركون في الدراسة بسنوات مختلفة من الخبرة بين (5≤ و≥20). وأخيرًا، فيما يتعلق بمتغير الملكية، بلغت نسبة المشاركين من العيادات الخاصة (89.1٪)، (الحكومية) (9.1٪) ومن الأنروا (1.8) من إجمالي حجم العينة. بالنسبة لأهم نتائج الاستبانة، يعتقد (78.50٪) من المشاركين أنهم بحاجة لمعرفة المزيد عن تدابير مكافحة العدوى. بينما يعتقد (85.7٪) من المشاركين بأن التطعيم هو الطريقة الأكثر توقعًا لمنع انتشار فيروس التهاب الكبد HBV.

أظهرت النتائج أن إجمالي الاستجابة الإيجابية فيما يتعلق بجميع مجالات ضبط العدوى المذكورة في الدراسة كانت (70.0٪). حيث أعطى المشاركون أعلى نسبة استجابة للقفازات (96.10٪)، تطهير الأسطح (78.00٪)، واقي الوجه (77.70٪)، ارتداء الملابس الواقية، غطاء الرأس والمعطف الأبيض (76.30٪)، غسل اليدين (76.10٪)، التطعيم ضد فيروس التهاب الكبد (74.50٪) وواقي العين (74.30٪). ثمة كانت النتائج أقل في مكافحة العدوى بما يتعلق بالاحهزة المستخدمة في عيادات الأسنان؛ اذ كانت نسبة الالتزام بتعقيم الأدوات (59.40٪)، السيطرة على الهباء الجوي وإدارة الحوادث ومراقبة الأوتوكلاف (55.1٪، 55.30٪، 47.20٪) على التوالي.

أظهرت النتائج أن هناك اختلافات كبيرة بين الذكور والإناث من حيث إدارة الحوادث" p=0.016"، أظهر اختبار T أن مجموعة الذكور (Mean= 0.73) (M) أفضل مما هي عليه في مجموعة الإناث (F) (متوسط = 0.64). النتائج أظهرت أيضا أن هناك فرقا كبيرا بين الممارس العام و المتخصصون في ارتداء القفازات " p= 0.009"، اذ ان المجموعة المتخصصة من أطباء الأسنان (متوسط = 2.70) هي أفضل من مجموعة الممارس العام (G.P) (متوسط = 2.48). الأخصائيون الذين يطبقون تعقيم الأدوات "p= 0.004" (متوسط = 0.55) أقل من

(G.P) (متوسط = 0.62). وبينت الدراسة أن هناك فرقاً كبيراً بين المحافظتين (نابلس وطولكرم) في سبعة مجالات وهي: ارتداء القفازات "p=0.001"، ارتداء ملابس واقية "p=0.035"، وغسل اليدين "p=0.000"، وتعقيم الأدوات "p=0.001"، و استخدام حواجز الحماية المتاح لتغطية بعض الأسطح "p= 0.001"، والتحكم في الهباء الجوي "p=0.008". بالاضافة الى إدارة الحوادث "p=0.003". وكانت جميع النتائج حول الامتثال لمجالات مكافحة العدوى أفضل دائما في طولكرم منها في محافظة نابلس. كما أظهرت الدراسة أيضا أن هناك اختلافات كبيرة في ارتداء واقي العين "p=0.005"، وارتداء الملابس الواقية "p= 0.000"، غسل اليدين "p=0.000"، أدوات التعقيم "p=0.000"، ومراقبة الأوتوكلاف "p=0.02"، وإزالة التلوث وتنظيف الأسطح، استخدام حواجز الحماية القابلة للتصرف لتغطية بعض الأسطح "p=0.000"، والتحكم في الهباء الجوي "p=0.035" وإدارة الحوادث "p=0.001" تعزى إلى متغيرسنوات الخبرة "P-<0.05". وأظهر اختبار Post-Hoc أن مجموعة (5> سنوات) كانت الأفضل في كثير من الأحيان بين جميع المجموعات الأخرى في المجالات (ارتداء القفازات، وغسل اليدين، وتعقيم الأدوات، وإزالة التلوث وتنظيف الأسطح، وذلك باستخدام حواجز الحماية التي يمكن التخلص منها لتغطية بعض الأسطح، وإدارة الحوادث، ومجالات التحكم في الهباء الجوي). وبينت الدراسة أن هناك اختلافات كبيرة في ارتداء قناع الوجه أثناء رعاية الأسنان "p=0.033"، ارتداء واقي العين

"p=0.003"، ارتداء الملابس الواقية "p=0.001"، غطاء الرأس والمعطف الأبيض "p= 0..001"، غسل اليدين "p=0.000"، مراقبة الأوتوكلاف "p=0.009"، إزالة التلوث وتنظيف الأسطح، استخدام حواجز الحماية القابلة للتخلص منها لتغطية بعض الأسطح "p=0.000" والتحكم في الهباء الجوي "p=0.04" المنسوبة إلى متغير الملكية "P<0.05". أظهر اختبار Post-Hoc أن مجموعة الأونروا كانت الأسوأ في تطبيق بعض تدابير مكافحة العدوى، كارتداء قناع الوجه "p=0.033"، واقي العين "p=0.003"، ارتداء ملابس واقية، غطاء الرأس ومعطف أبيض "p= 0.001"، غسل اليدين "p=0.000"، مراقبة الاوتوكلاف "p=0.00"، إزالة التلوث وتنظيف الأسطح، باستخدام الألواح الحماية القابلة للتصرف لتغطية بعض الأسطح "p=0.000"، و إدارة الحوادث "p= 0.047".

الخلاصة: تظهر نتائج هذه الدراسة أن هناك التزام متوسط النسبة لبروتوكول مكافحة العدوى في عيادات طب الأسنان في نابلس وطولكرم. وهناك حاجة إلى تعزيز الالتزام بتدابير مكافحة العدوى.