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Assessment of Adherence to Hygiene and Asepsis Protocols in the Dentofacial Orthopedics Department, Ibn Rochd University Hospital Center, Casablanca, Morocco

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ABSTRACT

Introduction: Dental practice is a focal point for cross-contamination, where dental surgeons and their assistants engage in daily activities posing infectious risks to both patients and themselves. Adhering to universal hygiene and asepsis recommendations is a professional, regulatory, and ethical obligation. This study aims to evaluate the attitudes and behaviors of practitioners in the orthodontics department of CCTD Casablanca,Morroco regarding hygiene and asepsis.

Methods: A quasi experimental study was conducted through passive observation of orthopedics practitioners at the dental consultation and treatment center (CCTD) at Ibn Rochd University Hospital Center (CHU) in Casablanca. Data were collected on evaluation sheets based on universal hygiene and asepsis recommendations. The study included an initial assessment period, a focus group trainingand a reassessment period Data were analyzed using descriptive and analytical statistics via SPSS.

Results: The results align with international studies, showing that practitioners do not fully comply with regulations concerning work attire, hand hygiene, work surface disinfection, or waste management. Additionally, no statistically significant difference was observed before and after training ($p \geq 0.01$).

Discussion: The study assessed the adherence of practitioners in the dento-facial orthopedics service to hygiene and asepsis guidelines, emphasizing the need for continuous training and the use of guides to maintain proper standards. It found significant improvements in practices such as hand washing, attire changing, and mask usage post-training, although initial adherence was often lacking.

Conclusion: Despite some persistent challenges, the study highlights the importance of regular monitoring and training in enhancing infection control measures.

Introduction

Around 1847, Hungarian physician Ignaz Semmelweis made the first observation regarding the significance of infection prevention and control in healthcare settings. He proved that a patient died as a result of a doctor's negligence in washing his hands before performing an examination[1] Dentistry only completely adopted the principles of infection control when the dangers of the Hepatitis B Virus (HBV) and the Human Immunodeficiency Virus (HIV) were identified in the 1970s and 1980s, respectively[2]. According to Sanly et al.[3], reducing person-to-person transmission requires constant and careful attention to infection control principles and practices.

Infection control is crucial not only for preventing cross-contamination and cross-infection but also for increasing the success rate of dental treatments[4] The significance of infection control is undeniable, especially with the rising prevalence of highly resistant organisms causing healthcare-associated infections (HAIs). In the USA, approximately 1.7 million HAIs occur each year, leading to nearly 100,000 deaths. HAIs have become a major cause of death, surpassing AIDS, breast cancer, and auto accidents combined. An estimated 5-10% of hospitalized patients in developed countries acquire HAIs, with even higher rates in underdeveloped countries. Most of these HAIs are preventable. Regardless of where dental care is provided, dental healthcare professionals are ethically and legally required to ensure the safety of both staff and patients[5].

Due to the complexity of dental procedures, including face-to-face communication with patients, frequent contact with saliva, blood and other body fluids, and handling of sharp instruments, a significant risk of infection transmission exists within dental settings[6]. There are many routes of transmission of microorganisms in dental clinics. These include inhaling airborne microorganisms that can remain suspended in the air for long periods of time; direct contact with blood, oral fluids, or other patient materials; contact of the oral and nasal mucosa or conjunctiva with microorganisms, including aerosols and droplets produced by an infected person and traveled short distances by speaking or coughing; and indirect contact with contaminated instruments or surrounding surfaces. Thus, standard universal precautions are to assume that all patients are carriers of infectious agents. Dentists are also expected to follow all necessary precautions[7,8].

The most frequently transmitted infections in dental settings include tuberculosis, syphilis, herpes infections, hepatitis B (HBV), hepatitis C (HCV), and AIDS (HIV)[9]. The COVID-19 pandemic has had a profound impact on dental practices, necessitating the implementation of stringent infection control protocols to minimize nosocomial transmission. Dentists now play a critical role in preventing the spread of such infectious diseases by adhering to enhanced safety measures and adapting to new guidelines for patient care[10].

Infection prevention in dentistry is supported by organizations like the CDC (Centers for Disease Control and Prevention) and the ADA (American Dental Association), with key measures including vaccination, hand hygiene, protective clothing, and instrument sterilization. These measures are universally applied regardless of the patient's serological status[9]. The CDC further emphasizes the importance of equipment disinfection, waste disposal, and dental unit water treatment[11]. At the Faculty of Dental Medicine in Casablanca, infection prevention is a central component of training, aiming to improve hygiene and asepsis practices among students and practitioners At the Faculty of Dental Medicine in Casablanca, infection prevention is a central component of training, aiming to improve hygiene and asepsis practices among students and practitioners.

The primary objective of this study is to assess the attitudes and behaviors of practitioners in the Dentofacial Orthopedics Department regarding hygiene and asepsis during treatment. Additionally, the study aims to develop a procedural guide for hygiene and asepsis measures to be implemented

in the department, with the goal of improving the conduct of hospital practitioners and enhancing the safety of care services.

Method

A quasi experimental study was conducted to assess the hygiene and asepsis practices in the Dentofacial Orthopedics Department at the Dental Consultation and Treatment Center (CCTD), Ibn Rochd University Hospital Center (CHU) in Casablanca, Morocco. The study included 9 residents and 2 dental specialists, while teachers, practitioners enrolled in the university diploma program for ODF, external interns, and students were excluded from the study.

An anonymous evaluation form based on international hygiene and asepsis recommendations was developed. It included six parts covering general information, individual hygiene, use of protection barriers, clinical gestures, equipment and surface disinfection, and waste management.

The survey was conducted in two phases with a training session held between them. The first phase consisted of an initial evaluation of hygiene and asepsis practices, which was conducted over two weeks. After this, a two-week training session was held, focusing on professional attire, the use of protective barriers, aseptic procedures, and waste management. The second phase involved a re-evaluation of the practitioners' practices after the training.

Data collected from the participants' questionnaires were analyzed using SPSS software version 20. A p-value of less than 0.05 was considered significant.

Approval for conducting the study was obtained from the Research Ethics Committee of Casablanca College of Dentistry. All participants were informed about the purpose of the study, and the questionnaires were completed anonymously to ensure the confidentiality of the information provided.

Results

The 11 female study participants responded back and filled the survey. Changes in work attire, hand hygiene, and the use of protective equipment are summarized in table I.

Table I: Compliance of Dental Practitioners with Hygiene, Hand Hygiene, and Protective Measures: A Before-and-After Training Analysis

Variables	Before training			After training		
	Yes %	No %	Sometimes%	Yes %	No (%)	Sometimes%
Work attire						
-Wearing the complete Outfit	0	100	0	0	100	0
-Wearing the lab coat	100	0	0	100	0	0
-Short sleeved attire	27,3	72,7	0	54,5	45,5	0
-Long sleeved attire	72,7	27,3	0	45,5	54,5	0
-Wearing street shoes	100	0	0	45,5	54,5	0
-Wearing clogs	0	100	0	9,1	90,9	0
-Changing attire at the end of the shift	63,6	18,2	18,2	100	0	0
Hand hygiene						
-Hands washed upon arrival to the service	9,1	63,6	27,3	36,4	63,6	0
-Hands washed before donning gloves	9,1	81,8	9,1	36,4	45,5	18,2
-Hands washed after removing gloves	36,4	36,4	27,3	72,7	18,2	0
-Hands washed at the end of the shift	27,3	45,5	27,3	63,4	36,4	0
-Use of gloves						

Variables	Before training			After training		
	Yes %	No %	Sometimes%	Yes %	No (%)	Sometimes%
-Use of single-use gloves by the practitioner	100	0	0	100	0	100
-Use of single-use gloves by the assistant	27,3	36,4	36,4	9,1	54,4	36,4
-Gloves changed for each patient	11	0	0	100	0	0
-Gloves changed if perforated or soiled	100	0	0	100	0	0
-Gloves reused after removal	63,6	18,2	18,2	18,2	27,3	54,4
-Gloves discarded immediately after use	100	0	0	100	0	0
Use of mask						
-Wearing mask by the practitioner	45,5	18,2	36,4	100	0	0
-Wearing mask by the assistant	18,2	45,5	36,4	18,2	72,7	9,1
-Mask changed for each patient	0	100	0	9,1	72,7	18,2
-Mask discarded immediately after use	90,9	9,1	0	100	0	0
Eye protection and wearing caps						
-Wearing protective glasses	9,1	90,9	0	0	100	0
-Wearing face shields	0	100	0	0	100	0
-Wearing caps	9,1	45,5	45,5	63,6	9,1	27,3

The findings reveal a notable reduction in aseptic faults and better hygiene management of frequently touched objects and dental equipment.

Table II focuses on aseptic practices, including the management of waste and disinfection processes.

Table II Compliance of Dental Practitioners with Aseptic Practices and Waste Management: A Before-and-After Training Analysis

Variables	Before training			After training		
	Yes %	No %	Sometimes%	Yes %	No (%)	Sometimes%
Wearing jewelry and hair management						
-Hair , veil secured	36,4	54,5	9,1	100	0	0
-Wearing jewelry/ bracelets , rings	72,7	27,3	0	27,3	72,7	0
-Artificial / long nails	9,1	90,9	0	0	100	0
Nail polish	9,1	90,9	0	27,3	72,7	0
Aseptic faults during care						
-Contamination of objects outside the work	72,7	0(0)	27,3	72,7	0	27,3
-Sharing bonding material by practitioners	0	100	0	54,5	18,2	27,3
-Disinfection of bonding material after use	36,4	36,4	27,3	63,6	27,3	9,1
-Sharing curing light by practitioners	0	100	0	90,9	9,1	0
-Disinfection of curing light after use	45,5	18,2	36,4	63,6	0	36,4
-Disinfection of retractors after use	90,9	9,1	0	100	0	0
-Disinfection of mirrors after use	90,9	9,1	0	2,7	18,2	9,1
-Disinfection of the chair between patients	27,3	0	72,7	63,6	0	36,4
Most frequentely touched objects by practitioners with contamination gloves						
-Phone	9,1	90,9	0	18,2	81,8	0
-Chair	90,9	9,1	0	54,5	45,5	0

Variables	Before training			After training		
	Yes %	No %	Sometimes%	Yes %	No (%)	Sometimes%
-Box	72,7	27,3	0	18,2	81,8	0
-Sandblaster	45,5	54,5	0	9,1	90,9	0
-Drawers	100	0	0	63,6	36,4	0
-Radio	36,4	63,6	0	27,3	72,7	0
Desinfction of different elements of the dental chair						
-Headrest	54,5	36,4	9,1	63,6	36,4	0
-Armrests	45,5	54,5	0	63,6	36,4	0
-Tray	72,7	18,2	9,1	81,8	18,2	0
-Switchs	54,5	36,4	9,1	63,6	36,4	0
-Spittoon	0	100	0	9,1	90,9	0
-Scialytic Handle	45,5	45,5	9,1	63,6	36,4	0
-Suction support and hose	45,5	54,5	0	63,6	36,4	0
-Handpiece support	81,8	18,2	0	72,7	27,3	0
-Handpiece cord	81,8	18,2	0	63,6	36,4	0
-Multifunction syringe body	81,8	18,2	0	81,8	18,2	0
-Multifunction syringe cord	72,7	27,3	0	81,8	18,2	0
-Rinsing the water system after each patient.	9,1	90,9	0	36,4	63,6	0

Discussion

This study evaluate the compliance of practitioners in the dento-facial orthopedics service with hygiene and asepsis rules, based on universal recommendations. It highlights the lack of comprehensive studies on dentists' adherence to infection control rules. Most existing studies focus on specific procedures using practitioner-filled questionnaires, which limit objectivity. Data was collected through passive observation to ensure objectivity. An anonymous, structured form with various criteria was used to reflect the reality of practitioners' actions. The survey involved two phases of evaluation and re-evaluation, observing three patients per practitioner to assess all hygiene and asepsis practices.

The study evaluated the individual hygiene practices of practitioners in the dento-facial orthopedics service, highlighting that none of the practitioners wore the full professional attire (coat, pants, clogs) either before or after training, often resorting to just a coat and street shoes.

The practice of changing attire at the end of shifts improved from 63.6% at initial evaluation to 100% upon re-evaluation. Hand washing, a crucial procedure in preventing disease transmission[13], showed notable changes. Initially, 81.8% of practitioners did not wash their hands before putting on gloves. Post-training, 36.4% of practitioners began washing their hands before glove use. Hand washing after glove removal increased from 36.4% to 72.7%. These findings are similar to those in a Jordanian study where 46% of practitioners consistently washed their hands before and after glove removal[14].

due to the absence of dedicated changing rooms. Contrastingly, a study in Canada revealed that between 17% and 65% of Canadian dentists wore complete professional attire[12].

However, an Iranian study indicates that the dentofacial orthopedic service has the lowest adherence rates to hand hygiene guidelines (39%) and personal protective equipment guidelines (73.5%).This could be related to the non-invasive nature of the procedures performed within the service[15]. Regarding poor hand hygiene, a recent meta-analysis conducted in Brazil in 2019 reported that adherence of dental students to hand hygiene

guidelines was below 50%, which makes infection control a serious challenge[16]. To solve this problem, they explained that continuous monitoring by the health inspectors and head nurses is imperative. Developing different strategies like hand hygiene campaigns are a method to encourage healthcare workers and improve their compliance.

The American Dental Association (ADA) recommends that dentists and dental assistants must always wear masks, protective eyewear, and gloves during clinical procedures to prevent cross-contamination[17]. Failure to change gloves contributes to microorganism spread and increases cross-contamination risk due to glove permeability over time[11]. In our study, all practitioners (100%) wore gloves for all clinical procedures, changed them after each patient or upon perforation, and disposed of them immediately after use, indicating a high awareness of hand-borne transmission risks. Similarly, Mutter et al evaluated several public clinics affiliated to dental schools, and reported that 100% of dental clinicians wore sterile gloves, and 85% of them changed their gloves between patients. Furthermore, in case of observing clear contamination, all dental clinicians replaced the contaminated items with new items[18].

Multiple infectious agents can be transmitted via airborne routes in dental practice, justifying the ADA's recommendation for mask usage by both dentists and assistants. Additionally, side protective eyewear is crucial for conjunctival transmission protection, although OSHA (Occupational Safety and Health Administration) has not yet accepted regular eyeglasses as a substitute for protective eyewear[19].

Masks must be changed between patients, after two hours of use, or when they become damp. Protective eyewear or face shields should be disinfected after each patient. Our study showed an increase in mask usage from 45.5% before training to 100% after training. Initially, 100% of practitioners did not change their masks between patients, but post-training, 9.1% began changing masks. Moreover, 90.9% of practitioners disposed of masks immediately after use before training, increasing to 100% post-training. Recent studies have shown an increase in the use of masks in dental practice[20] .It should be noted that the COVID-19 pandemic and the emphasis placed on wearing a face mask and adherence to infection control protocols may be responsible for acquiring a full score in items related to wearing a face mask in all clinics. A different result might have been obtained if the assessment had been performed in a different period of time[21].

Our study found no use of protective eyewear or face shields among practitioners. Similarly , a study conducted in Saudi Arabia showed that prior to the COVID-19 pandemic, dental clinicians had a poorer performance by 1.4 times regarding the use of protective goggles compared with after the emergence of COVID-19 pandemic[20]. The lack of eye protection among orthodontists may be due to the nature of their procedures, which typically do not involve blood splatter or aerosolization. However, some orthodontic interventions can unpredictably cause bleeding, justifying standard use of protective eyewear.

In our study, the wearing of jewelry during clinical procedures decreased from 72.7% at the initial evaluation to 27.3% after training. This aligns with an Australian study where 35.3% of participants did not wear any accessories[22]. Studies indicate that removing jewelry can significantly reduce bacterial colonies, supporting the recommendation to remove jewelry during care[23].

The handling of materials outside the work field showed that 72.1% of practitioners used contaminated gloves before and after training. This unchanged behavior may be due to the lack of chairside assistance, complicating patient management and aseptic practices. All practitioners shared bonding materials and curing lights before and after training due to limited availability compared to the number of functioning chairs.

Disinfection of bonding materials increased from 36.4% to 63.6% and curing lights from 45.5% to

63.6%. Regular disinfection of the treatment area (unit, spittoon, suction, surfaces) is crucial. The evaluation showed that regular chair disinfection after each patient increased from 27.3% before training to 63.6% after. Additionally, 90.9% of practitioners did not rinse the water system, but this improved to 36.4% post-training. Biofilm in dental unit water lines can transmit pathogens. Wheras, An Iranian study indicates that the dentofacial orthopedic service has the highest adherence rates to desinfection guidelines (80.7%)[15].

Regarding waste management, universal infection control guidelines state that used needles and sharps should be placed in puncture-resistant containers. All practitioners disposed of single-use items and sorted waste into specific containers. This aligns with an Indian study on biomedical waste management, where all sharp objects were placed in specific containers[24]. Similarly ,A German report showed 100% compliance with special containers for each waste type[18].

This study reveals that the practitioners in the dental-facial orthopedics service initially do not fully adhere to basic hygiene and asepsis measures but training positively impacted their attitudes, similar to findings from international studies. Moreover, the enhancement of hygiene and aseptic attitudes among practitioners following focus groups reiterating these measures highlights the importance of continuous training and the provision of guides and reminder sheets on appropriate standards within the service.

Necessary conditions for infection control guidelines implementation include:

-Provision of changing rooms for regulatory attire (coat, pants, clogs).

-Availability of individual bonding materials to avoid contamination through shared use.

-Provision of surface and suction system disinfection products for each treatment unit.

-Establishment of intra- and inter-departmental vigilance committees to ensure health safety standards for practitioners, students, assistants, and patients.

-Regular informational meetings to reinforce prerequisites and update recent hygiene and asepsis data.

-Implementation of technical guide sheets for reminders.

-Availability of a practical guide for infection risk control.

After the COVID-19 pandemic, there was a significant shift in the guidelines for asepsis and hygiene in dental practices to ensure the safety of both dental professionals and patients. The updated guidelines emphasize enhanced infection control measures to mitigate the risk of viral transmission[25].

Key Changes in Guidelines:

Universal Source Control: Patients and dental staff are required to wear masks at all times within the dental clinic, regardless of their symptoms. Physical distancing measures are enforced in waiting areas and non-clinical spaces.

Enhanced Personal Protective Equipment (PPE): Dentists and staff must use higher-level PPE, including N95 respirators, face shields, gowns, and gloves, particularly during aerosol- generating procedures. Regular training on proper donning and doffing techniques to ensure maximum protection.

Hand Hygiene: Rigorous hand hygiene protocols have been reinforced, including the use of alcohol-based hand rubs and thorough handwashing with soap and water. Hand hygiene is performed before and after patient contact, after contact with contaminated surfaces, and after removing gloves.

Environmental Cleaning and Disinfection: More frequent cleaning and disinfection of high- touch surfaces and dental equipment using EPA-registered disinfectants. Enhanced disinfection protocols between patients to ensure all surfaces are thoroughly sanitized.

Aerosol Management: Implementation of measures to reduce aerosol spread, such as using high-efficiency particulate air (HEPA) filters, dental dams, and

rubber dams during procedures. Emphasis on ventilation improvements in treatment rooms to enhance air circulation and reduce viral load in the air.

Patient Screening and Triage: Comprehensive pre-appointment screenings for infection symptoms and exposure history. Implementation of temperature checks and symptom questionnaires upon arrival at the dental clinic.

Administrative Controls: Changes in scheduling practices to reduce the number of patients in the clinic at any given time. Use of telehealth consultations where possible to minimize in- person interactions.

These measures aim to provide a safe environment for dental care and ensure that both practitioners and patients are protected against potential infections[26].

Conclusion

The prevention of infection transmission during medical care is rooted in professional obligations that are regulatory, ethical, and deontological in nature, applying to all healthcare professionals. Dental surgeons face specific challenges due to their exposure to blood and biological products, and the use of complex instruments in naturally septic environments, necessitating strict adherence to regulations regarding infection risk prevention. The increasing concerns over pathogen transmission, such as hepatitis viruses and HIV, coupled with the rise in drug-resistant microorganisms, make the adherence to hygiene and asepsis guidelines indispensable for protecting both healthcare teams and patients.To further improve the quality of infection risk prevention practices among all professionals at the Casablanca Center for Dental Consultation and Treatments (CCTD), evaluating the compliance with hygiene and asepsis standards among the medical and paramedical staff of all services would be prudent.

Conflict of Interest:

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