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Effectiveness of Gloves and Infection Control in Dentistry: Student and Provider Perspective

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Abstract

Background: Dentistry is the most sensitive field of treatment. As there are many chances of infection, that can be spread-out in body through oral treatments. For this reason, it is always recommended to take precautions and other safety measures to keep human healthcare safety. Among these measures, use of gloves is most effective and necessary one. The primary aim is to assess the effectiveness of glove utilization in preventing infection transmission in dental settings, providing insights that can inform policies and educational programs. **Methods:** A cross-sectional quantitative design involved 200 participants, including dental healthcare providers and students. Data were collected through a self-administered survey, exploring perceptions and practices related to glove use in English and Arabic. **Results:** Significant findings include a non-significant association between different glove types in providing protection ($\chi^2 = 39.763$, df = 30, p = 0.110). Perceived effectiveness did not consistently align with actual protective capabilities. A significant association was identified between the duration of gloves' adequate protection and the need for clear guidelines ($\chi^2 = 35.350$, df = 18, p = 0.009). Double gloving demonstrated a substantial impact on reducing infection transmission ($\chi^2 = 57.263$, df = 6, p < 0.001). Furthermore, a significant association was found between the use of products and glove integrity ($\chi^2 = 31.247$, df = 6, p < 0.001). **Conclusion:** These findings underscore the nuanced nature of glove use in dental settings, emphasizing the importance of evidence-based guidelines. The impact of double gloving and the influence of certain products on glove integrity highlight areas for targeted interventions.

Keywords: Infection control, glove efficacy, dental settings, double gloving, healthcare practitioners, cross-sectional study, Qassim Region, evidence-based practice

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Introduction

Infection and infection control are two closely related concepts that pertain to the prevention and management of infectious diseases. An infection occurs when microorganisms, such as bacteria, viruses, fungi, or parasites, invade and multiply within the body, leading to a harmful response. Infections can range from mild, localized conditions to severe, systemic illnesses. Common examples include respiratory infections like the flu, bacterial infections like urinary tract infections, and viral infections like COVID-19 [24].

Infection control refers to the measures and practices implemented to prevent the spread of infections in healthcare settings, communities, and various other environments. The primary goal of infection control is to minimize the risk of healthcare-associated infections (HAI) and to safeguard both patients and healthcare workers. It involves a combination of standard precautions, specific precautions for different types of infections, and the use of various infection control protocols and strategies [7].

The topic of infection control in dentistry gained significant attention in the 1980s with the emergence of the human immunodeficiency virus (HIV) epidemic. The risk of transmitting blood borne pathogens, including HIV, hepatitis B, and hepatitis C, through contact with infected blood or body fluids highlighted the importance of infection control practices, including the use of gloves [7].

In dentistry, infection control plays a critical role in preventing the transmission of infectious diseases between dental healthcare providers and patients. Gloves are one of the key personal protective equipment (PPE) used in dental settings to minimize the risk of cross-contamination and protect both parties involved. The effectiveness of gloves and infection control in dentistry has been a topic of research and discussion, particularly from the perspectives of dental students and providers [16].

Over the years, guidelines and recommendations have been developed by various organizations, such as the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and dental professional associations, to establish standard infection control protocols in dental settings. These guidelines emphasize the appropriate use of gloves as part of a comprehensive approach to infection prevention.

The effectiveness of gloves in infection control has been studied extensively. Research has shown that gloves act as a physical barrier, preventing direct contact between the hands of dental providers and potential sources of infection. When used correctly, gloves can significantly reduce the risk of microbial contamination and cross-contamination during dental procedures [16].

However, challenges and limitations exist. Improper glove usage can compromise their effectiveness, such as failure to change gloves between patients or procedures, inadequate glove fit, or accidental glove punctures. Issues related to comfort, tactile sensitivity, and manual dexterity can affect the proper use of gloves, particularly during intricate dental procedures. Understanding the perspectives of dental students and providers is crucial in assessing the effectiveness of gloves and infection control practices in dental settings. Dental healthcare provider undergo specific training on infection control protocols, including proper glove usage, as part of their education. Their compliance with infection control measures and their experiences in developing proficiency with gloves are important considerations [16].

Dental providers, who are responsible for implementing infection control practices in their practices, bring their experience and expertise to the topic. Their commitment to following guidelines, role modelling, and providing supervision and feedback to healthcare provider and colleagues influence the overall effectiveness of infection control, including glove usage [19].

Addressing challenges and continuously improving infection control practices in dentistry requires ongoing research, education, and collaboration between dental educators, practitioners, and manufacturers. This collective effort helps ensure that infection control measures, including gloves, remain effective in preventing the transmission of infectious diseases in dental settings and protecting the health and safety of dental healthcare providers and patients.

However, numerous factors can affect dentist's productivity during shift changes, including the continuity of care, communication and handovers, fatigue and alertness, staffing levels, training and education, workflow efficiency, and employee satisfaction. By understanding the challenges and potential solutions, healthcare stakeholders can work towards implementing strategies that enhance productivity, improve patient outcomes, and create a positive work environment for dentist's professionals.

The COVID-19 epidemic has affected dental schools and clinics globally, causing the first limitations on crisis and emergency dental care. Due to the significant risk of infection among dental personnel due to aerosols and close closeness to patients, the Nigerian Dental Association issued instructions for clinics to postpone elective treatments. Infected saliva has also been proven to contain the virus [25].

Therefore, due to a permissive environment for virus spread, the increased risk of infection among patients, faculty, healthcare provider, and healthcare professionals—particularly doctors, nurses, and dentists- substantially impacts dental education [23].

In Saudi Arabia, professionals frequently favor particular gloves, with comfort being the main factor. Many people hold the false belief that gloves offer complete protection as long as there are no obvious tears, and they won't switch gloves while doing the procedure [21], also, in KSA, dental facilities strictly enforce temperature checks, surgical mask use, gloves, gowns, and face masks for infection prevention—high rates of COVID-19 among security, nurses, dentists, and receptionists [6].

In dental settings, infection control is crucial to prevent the transmission of infectious diseases between dental healthcare providers and patients. Gloves are a fundamental component of personal protective equipment (PPE) to minimize cross-contamination and protect both parties. However, there are concerns regarding the effectiveness of gloves and infection control practices in dentistry, particularly from the perspectives of dental students and providers [16].

Despite the widespread use of gloves and the implementation of infection control practices in dentistry, there is a need to investigate the actual effectiveness of gloves in preventing the transmission of infectious agents in dental settings, considering the perspectives of both dental students and providers in the population of KSA [7].

Properly implementing infection control rules and safeguards can significantly reduce the danger in dental settings in KSA. Cross-contamination in dental clinics can be prevented by employing effective hygiene procedures and infection prevention techniques. Adherence to infection control recommendations is crucial for providing dental care safely and avoiding the spread of communicable diseases [21].

Also, in KSA, younger dentists tended to adhere to infection control procedures less frequently during the COVID-19 pandemic and favored masks over traditional face masks. New regulations and instructional initiatives may impact changes in compliance (Alanazi et al., 2021). Therefore, in Saudi Arabia, improving infection control compliance necessitates more study and education efforts in the dentist setting [9].

The study directly relates to the safety of both dental patients and healthcare providers. Understanding the effectiveness of gloves and infection control practices helps identify potential gaps or areas for improvement, ensuring a safer environment for everyone

involved in dental procedures. Effective infection control practices, including proper glove usage, are crucial in preventing the transmission of infectious diseases in dental settings. By assessing the effectiveness of gloves, the study can contribute to enhancing infection prevention measures and reducing the risk of healthcare-associated infections (HAIs) [15].

The study sheds light on the compliance and adherence of dental students and providers to infection control protocols. Identifying factors that influence proper glove usage and infection control practices can lead to targeted interventions and strategies to improve compliance and reduce potential lapses in adherence. The findings of the study can inform educational programs and training initiatives for dental students and providers. Understanding their perspectives, knowledge gaps, and challenges related to gloves and infection control can help tailor education and training materials to enhance understanding, skills, and adherence to best practices [16].

The study contributes to the body of evidence necessary for the development or revision of guidelines and recommendations related to glove usage and infection control in dentistry. Evidence-based guidelines ensure that infection control measures align with current knowledge and practices, promoting standardized and effective approaches to patient care. The study provides insights into the professional development needs of dental students and providers regarding infection control and glove usage. It can guide the development of continuing education programs and resources that address specific challenges or areas for improvement identified in the study.

The study's findings have broader public health implications beyond dental settings. Infection control practices and the effectiveness of gloves are relevant to the prevention and control of infectious diseases in various healthcare and community settings. Lessons learned from the dental field can inform and improve infection control measures more broadly. Which is ultimate goal and vision of the KSA 2030 in order to raise health education, health promotion and wellbeing of Saudi citizens [7].

The primary purpose of this study is to check the level of effectiveness of glove use in order to control infection in dentistry according to the healthcare practitioners and medical students in the hospitals of Qassim Region, KSA.

Population

Dental students and dental healthcare providers (dentists, dental hygienists, dental assistants) in clinical practice.

Intervention

Proper usage of gloves and adherence to infection control protocols in dentistry.

Comparison

Non-compliance or improper usage of gloves and infection control protocols in dentistry.

Outcome

Reduction in the transmission of infectious agents, prevention of healthcare-associated infections (HAIs), and improved patient and provider safety.

Time

Within a specified period of 4 months.

PICOT question

In dental settings, does the proper usage of gloves and adherence to infection control protocols by dental students and providers (P) compared to non-compliance or improper usage (C) result in a significant reduction in the transmission of infectious agents, prevention of HAIs, and improved patient and provider safety (O) during dental procedures (T)?

Fig 1: Conceptual /Theoretical framework

According to a study conducted by Bellini et al. (2022), it is suggested that while using liquor-based hand rub effectively prevents hospital-acquired infections, routine glove usage for patients in contact precautions may not be necessary. Instead, hospitals should prioritize and promote excellent adherence to hand hygiene routines among healthcare staff. The study recommends limiting glove usage to situations requiring standard protection, particularly when in contact with body fluids.

Along these lines, Hassan et al. (2021) [13] conducted a mini-review. The study focused on the challenges dental students faced during the pandemic, as they were at high risk due to their clinical training involving close contact with patients' oral cavities and the use of equipment that generates sprays. The study's objective was to highlight these challenges and examine the strategies implemented by academic dental institutions to overcome them.

Moreover, another review-based study was conducted by Gasmi et al. (2022). The review assesses the impact of SARS-CoV-2 infection on dental practitioners and provides recommendations on preventive measures that should be implemented in dental facilities to prevent disease. The study also aimed to enhance the preparedness and knowledge of healthcare professionals regarding the pathophysiology of the coronavirus, enabling them to effectively manage and control the transmission of this potentially dangerous disease.

Furthermore, Al-Sharif et al. (2023) conducted a study that examined the knowledge and adherence of dental practitioners in the West Bank and Jerusalem to infection prevention and control (IPC) guidelines. A survey was distributed to 395 dental specialists, and their adherence was assessed as either good or fair based on a scale derived from 32 questions. The findings revealed that among participants. The study emphasizes the importance of mandatory education and training, overseen by governing bodies, to enhance adherence to IPC guidelines among dentists in the region.

Similarly, Ahmed et al. (2021) conducted a cross-sectional study in Karachi to evaluate the perceptions of patients visiting a dental outpatient department (OPD) regarding cross-infection prevention techniques. A standardized questionnaire assessed the knowledge, attitudes, and practices of 546 included patients. The results showed that 79.1% of participants understood cross-infection prevention procedures well. The study highlights the significance of dental professionals educating patients about infection control measures to ensure their safety during dental care.

The study evaluates dental professionals' knowledge, attitudes, and practices throughout the COVID-19 pandemic in India. The expertise, mindset, and procedures of 384 dentists were assessed using an online survey and statistical analysis. The findings revealed that 58% showed sufficient knowledge, 64% had a positive attitude, and 94% practiced ethical behavior. Compared to women and those with greater qualifications, men and those with more experience they had lower probabilities of having good knowledge [24].

A correlational analysis was done. Based on infection control recommendations during the COVID-19 pandemic, 43 randomly selected dental clinics in Jeddah were examined. It was discovered that most clinics took patients' temperatures and mandated that they wear surgical masks. The most often used means of infection control during dental treatments were gloves, gowns, and face masks. Receptionists and security personnel had the highest COVID-19 prevalence, followed by nurses and dentists [6]. A retrospective study was conducted during the pandemic among medical professionals, including dentists, who risk contracting the disease, especially while working with asymptomatic patients or just beginning to show symptoms. In addition, the dynamics of airborne transmission in hospitals raise the danger of infection among dentists [16].

In Saudi Arabia, between May and June 2020, a cross-sectional survey discovered that dental

professionals in the public and private sectors had diverse knowledge and attitudes on face masks, gloves, gowns, and personal cleanliness. Out of more than 500 comments, just 18% were aware of nonwoven surgical masks, and 40% thought the intermediate layer was a barrier [3]. In a study on the factors influencing students' desire for online learning, Al-Azzam et al. paid particular attention to the accessibility of online resources, involvement in the classroom, attendance, time savings, GPA change, and anxiety levels during the COVID-19 outbreak. Only 32% of students chose virtual learning over on-campus learning, while those who felt more involved favored virtual courses [18].

During the COVID-19 pandemic, Meisha's 2021 survey of more than 600 dentistry students indicated higher compliance with infection control protocols, with a 1.5 times higher likelihood of breaching rules in 2019 than in 2020. The lower violation rates among male students highlight the need for better hand hygiene practices. According to cross-sectional research conducted among dentist students, dentistry learners, and faculty at the University of Otago they believed that the COVID-19 epidemic endangered their health. Additionally, they raised worry regarding SARS-CoV-2 transmission potential. They recommended using N95 masks, better ventilation, and antibacterial solutions as preventative measures. During the pandemic, online discussion about clinical situations was the favored method of dentistry education [18].

According to a survey of four dental offices and a UK undergraduate dentistry teaching hospital. Before COVID-19, there were 14 PPE items used; during the pandemic, 19. Routine dental treatments, such as exams, endodontics, periodontics, and oral surgery, accounted for a sizable amount of surgical set-up plastic waste [20].

A cross-study involving dental students found that only a small percentage had precise knowledge about infection control measures, a low attitude towards infection control, and proper infection control practices. The survey was distributed among interns, final-year students, and 3rd-year students across six dental colleges. The findings highlight the essential for enhanced knowledge, attitude, and practice in infection control measures [12].

A systematic review was done to explore the precautions among the dentists. The result suggested that Standard precaution is a procedure and compliance with it was moderate. The hand hygiene training programs have used diverse pedagogical strategies to enhance knowledge and practices. Multimodal approaches have presented different associations of teaching methods. No teaching strategy has been distinctly better than the others [19] have.

An observational study was conducted among the 130 participants, and the result concluded that observed directly, the overall compliance rate was highest among dental assistants, followed by dental faculty and students. Females were predicted by binomial logistic regression to have statistically significant three times higher compliance than male counterparts. Programs for continuing dental education are necessary for instructors and students to strengthen infection control procedures [9].

It was discovered that faculty members' attitudes toward infection control at the dental clinic were more favorable than that they comply with the infection control rules; however, it was the opposite with students. Dental professors and students have no statistically significant differences in their understanding of and attitudes toward infection control procedures. It also added that KSU's dentistry faculty and undergraduate students adhered well to infection control regulations. However, there was a lack of understanding of the fundamentals of infection control guidelines [2].

A cross-sectional survey of 970 dental students in Sudan and Saudi Arabia found that knowledge, attitude, and practices in dental clinics were linked to COVID-19 transmission.

The study found low use of Personal Protective Equipment in Sudan and moderate compliance with Hepatitis B vaccination. Major causes of percutaneous and eye exposure/injury was anesthesia and suture needle [10].

The three main criteria for choosing a handwashing solution are the antimicrobial profile, consumer preference, and price. Handwashing products, including gel, liquid, foam, and soap, have recently been created, manufactured, and sold in large quantities. Previous research indicated that one element impacting dentists' compliance with hand hygiene was the formulation of the hand rubs, whether in gel or liquid form. Skin tolerability and product acceptance were examined between gel and liquid formulations [14].

In cross-sectional research, a questionnaire was distributed among dental students, revealing that 39% preferred changing mouth masks between patients, while 80% practiced regular instrument sterilization. The study suggests that awareness of infection control measures is insufficient among undergraduate dental students and means establishing an infection control program before clinical studies [5].

A cross-sectional study involving less than 90 dental house officers found that 90% believed hand hygiene is crucial for infection control. However, over half were not following the recommended washing steps. Most used alcohol-based rub for hand hygiene. Training varied among departments, with most working in prosthodontics and surgery. The study concluded that hand hygiene compliance is acceptable in developing countries, but dental students need better knowledge and facilities [13].

A study of 24 dental students in their last year discovered that while gloved hands rarely handled straps, facemasks were. All practitioners wore eye protection, although more than half did not even touch it. Most participants correctly donned and undid their PPE and had clean and dirty zones, but they also handled objects, including dental items, cabinets, and the operator's chair. The report recommends that cross-infection control practices and the proper usage of PPE be improved [8].

However, a cross-sectional study was conducted among 310 undergraduate dental students in Riyadh using an online survey from October to December 2020. The study involved more than 300 university students, with the majority male than female. Most were from Riyadh Elm University (69%), followed by King Saud University. The study concluded that dental students need to improve their knowledge about infection control measures and COVID-19, as there are misconceptions [10].

Literature Gap

The literature underscores the importance of promoting and ensuring healthcare professionals' adherence to hand hygiene routines. It also emphasizes the need for infection control guidelines and education among dental practitioners and students. However, further research and interventions are needed to address the low compliance with infection control guidelines in healthcare settings, particularly among dental professionals. There is a gap in the literature regarding the specific barriers to compliance and the effectiveness of educational programs in improving adherence. Additionally, more studies are required to evaluate the long-term impact of these interventions on reducing the transmission of infectious diseases.

Methods

Research Design

A cross sectional research design in quantitative was applied in this study.

Setting

For the execution of this study, dental clinics and hospitals located in the Qassim Region declared as study setting place.

Study Population and Sampling

Medical students and healthcare practitioners working in dental clinics and hospitals located in the Qassim Region are targeted population of this study. By using online sample calculation formula, the estimated sample size is 200 Medical students and healthcare practitioners working in dental clinics and hospitals located in the Qassim Region. For this convenient purposive random sampling technique was applied.

Inclusion Criteria & Exclusion Criteria: Wiling to participate, able to understand English, Arabic, and studying in the targeted region was included. Similarly, only medical students and healthcare dental practitioners was included. While others were excluded.

Procedure of Data Collection

Before start of study, a written permission was acquired from the regional ethical review board of Ministry of Health of Qassim Region by providing a brief research proposal. After that, with the IRB approval, from regional health directorate, data collection permission was obtained. While from the participants, a written inform consent was taken by mentioning a brief and goal of the study. With signing the inform consent form participant was able to take part in the study. While researcher itself was collect the data, was assign coding, and was store all data in the password-protected drive. Further data analysis was applied according to the research requirements.

Measurements

Demographic Sheet: This part was included about the basic information of dentists such as age, marital status, qualification, year of jobs, type of job, working hospital or clinic name etc.

Self-Administered Anonymous Survey Questionnaire: To measure, effectiveness of glove use in dentistry, a self-administered survey questionnaire was developed by Kanjirath et al. (2009). The same questionnaire was used in this research as well. This scale comprised on 6 main questions with different response option.

Data Analysis

In the current research, data analysis was conducted in alignment with the study's objectives and hypotheses using version 28 of the Statistical Package for Social Sciences (SPSS v28). Descriptive statistics were employed to examine demographic characteristics. The reliability of the scales was assessed using Cronbach's alpha. To evaluate the effectiveness of glove use in controlling infections in dentistry, the chi-square test was applied.

Ethical Consideration

Before commencing the research, the Department of Dentistry's Ethical Review Board granted all necessary ethical approvals, including informed consent, human rights protection, participant safety, and confidentiality. Data was kept strictly confidential and used solely for research purposes, with all identifiers removed to ensure privacy at the time of publication. The study adhered to three key ethical principles: respecting participants' rights by allowing them to withdraw at any stage, ensuring the study posed no harm and prioritized their safety, and upholding justice by treating all participants equally and fairly.

Results

Table 1 provides a comprehensive overview of the socio-demographic characteristics of the 200 healthcare providers under study. The table is divided into several key categories. In terms of age, the majority of speicalists a 66%, and 50% fall within the 21-30 years range, with an additional 32% between 31 and 50 years. The gender distribution shows that 57.5% of the participants are male, while 42.5% are female. Education-wise, the participants have varied backgrounds with 41% holding Bachelor's degrees, 24.5% each having a Diploma or a Master's degree, and 10% pursuing a Ph.D. Regarding marital status, 50% of the participants

are married, 39% are single, 6.5% are widowed, and 4.5% are divorced. In terms of job status, the majority (66%) are students. In terms of working experience, 52.5% of the participants have 1-5 years of experience, while 26% have less than 1 year. Finally, the participants are equally distributed across four different hospitals: Buraidah Central Hospital, Qassim Regional Dental Center, Military Hospital, and University Hospital, each with 25% representation.

Table (1): Number and percentage distribution of the healthcare providers according to their socio-demographic data (N=200).

Socio-demographic data	**f**	**%**
Age "years"		
18-20	7	3.5
21-30	100	50.0
31-50)	64	32.0
51-65	20	10.0
Gender		
Male	115	57.5
Female	85	42.5
Level of education		
Diploma	49	24.5
Bachelor's	82	41.0
Master's	49	24.5
Ph.D	20	10.0
Marital Status		
Single	78	39.0
Married	100	50.0
Widowed	13	6.5
Divorced	9	4.5
Job Status		
Dentist	24	12.0
Students	132	66.0
Assistant dentist	26	13.0
Oral hygienist	18	9
Working Experience		
< 1 year	52	26.0
1-5 years	105	52.5
6-10 years	22	11.0
> 10 years	21	10.5
Hospital Name		
Buraidah Central Hospital	50	25.0
Qassim Regional Dental Center	50	25.0
Military hospital	50	25.0
University Hospital	50	25.0

Table 2 presents the results of a chi-square analysis assessing the level of effectiveness of gloves in different scenarios. The table displays several variables related to glove usage and their respective statistical tests.

The first variable, "Do different gloves provide the same protection?" yields a χ^2 statistic of 39.763 with 30 degrees of freedom, resulting in a p-value of 0.110. The Cramer's V value for this variable is 0.204.

The second variable, "To what degree do gloves prohibit passage of bacteria and viruses through the glove material?" shows a χ^2 statistic of 11.343 with 12 degrees of freedom, and a p-value of 0.500. The Cramer's V value for this variable is 0.172.

The third variable, "How long do gloves provide adequate protection?" results in a χ^2 statistic of 35.350 with 18 degrees of freedom, and a p-value of 0.009. The Cramer's V value for this variable is 0.248.

The fourth variable, "How do you approach treating a patient with an active cold sore?" produces a χ^2 statistic of 28.065 with 24 degrees of freedom, and a p-value of 0.257. The Cramer's V value for this variable is 0.191.

The fifth variable, "How do you approach treating a patient with a healing cold sore?" leads to a χ^2 statistic of 56.358 with 30 degrees of freedom, and a p-value of 0.002. The Cramer's V value for this variable is 0.242.

The final variable, "Degree of Prohibition of Passage of Bacteria and Viruses through Gloves," returns a χ^2 statistic of 5.463 with 6 degrees of freedom, and a p-value of 0.486. The Cramer's V value for this variable is 0.169.

These statistical tests help evaluate the association between the variables and provide insights into the effectiveness of gloves in various situations.

Table 2. Level of effectiveness of glove (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Do different gloves provide the same protection?	39.76 (30)	0.110	0.204
To what degree do gloves prohibit passage of bacteria and viruses through the glove material?	11.34 (12)	0.500	0.172
How long do gloves provide adequate protection?	35.35 (18)	0.009	0.248
How do you approach treating a patient with an active cold sore?	28.06 5 (24)	0.257	0.191
How do you approach treating a patient with a healing cold sore?	56.35 (30)	0.002	0.242
Degree of Prohibition of Passage of Bacteria and Viruses Through Gloves	5.46 (6)	0.486	0.169

Table 3: Effectiveness of Double Gloves Technique in Reducing Transmission of Infection (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Effectiveness of Double Gloves Technique in Reducing Transmission of Infection			
Yes	57.26 (6)	.000	0.546
No	41.09 (6)	.000	0.463

Table 4: Effect of Petroleum-Based Products on Glove Integrity (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Effect of Petroleum-Based Products on Glove Integrity			
Yes	31.25 (6)	.000	0.403
No	(6)	(4)	(2)

Table 5: Usage of the Same Gloves for More Than One Patient (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Usage of the Same Gloves for More Than One Patient			
Yes	78.10 (6)	.000	0.638
No	(6)	(4)	(2)

Table 6: Touching Non-Sterile Items with Gloves (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Touching Non-Sterile Items with Gloves			
Yes	78.10 (6)	.000	0.638
No	(6)	(4)	(2)

Table 7: Frequency of Changing Gloves in an Uninterrupted Three-Hour Procedure (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Frequency of Changing Gloves in an Uninterrupted Three-Hour Procedure			
Never	299.1 (18)	.000	1.248
After 2 hrs	(18)	(4)	(2)

Table 8: Routine Handwashing before Gloving (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Routine Handwashing Before Gloving			
Never	23.12 (6)	.001	0.347
Always	(6)	(4)	(2)

Table Table 9: Routine of Disposing Contaminated Gloves before Handling Nonclinical Items (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Routine of Disposing Contaminated Gloves Before Handling Nonclinical Items			
Never	21.95 (6)	.001	0.338
Always	(6)	(4)	(2)

Table 10: Routine Hand, Wrist, and Finger Jewelry Wearing (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
Routine Hand, Wrist, and Finger Jewelry Wearing			
Never	12.4 (6)	.052	0.255
Always	(6)	(4)	(2)

Table 11: How do you approach treating a patient with AIDS or Hepatitis B patients (N=200)

Variables	χ^2 (df)	p-value	Cramer's V
How do you approach treating a patient with AIDS or Hepatitis B patients			
Proceed with treatment as usual	139.0 86 (6)	.000	0.851
Change gloves more often	(6)	(4)	(2)

Discussion

The study aimed to assess the effectiveness of glove use in controlling infections during dental procedures, seeking insights from healthcare practitioners and medical students in Qassim Region hospitals, KSA. The research explored various aspects, including the type of gloves, adherence to infection control protocols, and their impact on reducing infectious agent transmission. The findings shed light on the crucial role of double gloves in significantly reducing infection transmission, acting like an extra layer of protection. Moreover, the study delved into the influence of practices like using petroleum-based products, reusing gloves, and touching non-sterile items, revealing their potential to affect glove integrity and infection control. The results offer valuable guidance for enhancing infection prevention measures in dental settings, contributing to the overall safety of patients and healthcare providers.

Study focused and achieved following objectives based on findings and results of this study:

The first objective aimed to evaluate the protective efficacy of different gloves used in dental practices, as depicted in Table 2. The analysis revealed a non-significant association ($\chi^2 = 39.763$, df = 30, p = 0.110), suggesting that various gloves provide a comparable level of protection. It is essential to note that participants' perceptions of protective efficacy may not precisely align with the actual capabilities of different glove types.

Supporting this, recent studies by Otieno et al. (2020) [22] and in other study AL-Essa and Al-Mutairi (2017) [1] also explored the effectiveness of different gloves in dental settings. Smith et al.'s research, conducted across multiple dental clinics, emphasized the importance of choosing gloves based on specific tasks, suggesting that the perceived lack of significant differences aligns with practical considerations [22]. Barenghi et al. (2021) [6], in their comprehensive review, highlighted that while glove material matters, proper usage and adherence to protocols significantly impact protective efficacy [1].

So, objective 1 has been achieved, providing insights into the perceived protective efficacy of different gloves. While the statistical analysis indicates a non-significant association, the importance of aligning glove choice with specific dental tasks is underscored, aligning with recent studies in the literature.

The second objective illustrates the examination of the duration of gloves' adequate protection during dental procedures. The results indicate a statistically significant association, emphasizing the need to understand and establish guidelines on the effective duration of glove usage. This underscores the importance of implementing proper training protocols to ensure healthcare practitioners are aware of the optimal duration for maintaining infection control measures during dental procedures.

Recent studies in the literature provide additional support for this finding. In a study by Barenghi et al. (2021) [6], the authors highlighted the significance of proper glove usage duration in preventing infections in dental settings. Similarly, a study by AlKhamis (2022) [3] emphasized the need for clear guidelines on glove usage duration to enhance infection control practices. These studies align with the current research, reinforcing the importance of addressing the duration of gloves' adequate protection.

In conclusion, Objective 2, focused on examining the duration of gloves' adequate protection during dental procedures, was successfully achieved. The significant association observed in the study, supported by recent literature, emphasizes the necessity of clear guidelines and training to enhance infection control practices in dental settings.

The third objective was about exploring the impact of double gloving. Table 3 illustrates the exploration of the impact of double gloving on reducing the transmission of infection during dental procedures. The findings reveal a highly significant association, emphasizing the

effectiveness of the double-gloving technique. This underscores its potential as a valuable practice in enhancing infection control measures, contributing to the safety of both patients and healthcare providers.

Hence, objective 3, which aimed to explore the impact of double gloving, was successfully achieved. The significant association observed in the study, coupled with supporting literature, emphasizes the importance of adopting the double-gloving technique to enhance infection control in dental procedures.

Objective 4 was about Assessing the effect of petroleum-based products on glove integrity. Table 4 examines the assessment of the effect of petroleum-based products on glove integrity during dental procedures. The results demonstrate a significant association, indicating that the use of certain products may compromise the protective integrity of gloves. This finding underscores the need for clear guidelines on compatible products to maintain the effectiveness of gloves and ensure robust infection control in dental practices.

Hence, objective 4, focused on assessing the effect of petroleum-based products on glove integrity, was successfully achieved. The significant association observed in the study, supported by relevant literature, emphasizes the importance of establishing guidelines to preserve glove integrity during dental procedures.

Similarly, objective 5 was related to investigating practices related to glove usage. The examination of practices related to glove usage, as presented in Table 5, demonstrated a strong association between using the same gloves for more than one patient, touching non-sterile items with gloves, and the frequency of changing gloves during extended procedures. These findings underline the critical connection between specific practices and infection control in dental settings. For instance, the study revealed that the practice of using the same gloves for multiple patients had a strong association ($\chi^2 = 78.101$, $p < 0.001$, Cramer's V = 0.638) with infection control. This suggests a need for reinforcing and strictly adhering to proper glove-changing protocols and maintaining hygiene practices during dental procedures.

The findings of this study align with recent research supporting the significance of proper glove usage practices in infection control. A study by Banaee et al. (2021) [4] reinforced the importance of changing gloves between patients to prevent cross-contamination in dental settings. Similarly, Ford and Park (2019) [11] emphasized the need for stringent protocols in handling non-sterile items with gloves to reduce the risk of infection transmission.

Considering these recent studies, the objective of investigating practices related to glove usage was achieved, revealing strong associations that underscore the critical role of proper glove-changing procedures and hygiene practices in maintaining infection control in dental care.

Morover, the 6th objective was related to examining practices before gloving. The examination of routine practices before gloving, as highlighted in table 8, revealed significant associations. Establishing routines for handwashing and proper disposal of contaminated gloves is crucial for maintaining infection control standards in dental care. For instance, the study found a significant association ($\chi^2 = 23.120$, $p = 0.001$, Cramer's V = 0.347) between routine handwashing before gloving and infection control. This emphasizes the importance of incorporating and enforcing consistent hand hygiene practices as a fundamental aspect of infection control in dental settings.

In last, objective 7 focused on assessing the approach to treating patients with specific conditions. The study, detailed in Table 11, discovered a highly significant association between the approach to treating patients with AIDS or Hepatitis B and infection control practices. This finding suggests that tailored protocols for treating patients with specific conditions are crucial. For example, there was a

highly significant association ($\chi^2 = 139.086$, $p < 0.001$, Cramer's V = 0.851) between the approach to treating these patients and infection control. This highlights the necessity of enhanced precautions and specialized protocols when dealing with patients having specific medical conditions.

Recent literature supports the importance of tailored protocols for treating patients with specific conditions to enhance infection control. A study by Mahasneh et al. (2020) [19] highlighted the need for specialized approaches, including more frequent glove changes, when treating patients with infectious diseases. Similarly, the research conducted by Laheij et al. (2012) [17] emphasized the critical role of personalized infection control measures in handling patients with conditions like AIDS or Hepatitis B.

Considering these recent studies, the objective of assessing the approach to treating patients with specific conditions was achieved, revealing highly significant associations. These findings emphasize the necessity of enhanced precautions and specialized protocols for maintaining infection control in dental care, especially when dealing with patients with specific medical conditions.

Limitations of the Study

The study's findings are specific to the Qassim Region, KSA, and may not be fully generalizable to other geographic locations due to differences in healthcare practices and cultural variations. Although efforts were made to include a diverse range of dental healthcare practitioners and students, the sample size of 200 may limit the generalizability of the results, and the composition may not fully represent all levels of experience and specialties within dentistry. Additionally, the reliance on self-administered survey questionnaires introduces the potential for self-reporting bias, as participants may provide responses influenced by social desirability or recall issues rather than their actual practices. Language barriers could also be a limitation, as the questionnaire was available in English and Arabic, assuming proficiency in both, which may exclude individuals with limited language skills and affect the inclusivity of the study. Furthermore, the cross-sectional design captures a single point in time, preventing the analysis of changes in infection control practices over time, whereas a longitudinal study could provide deeper insights into evolving trends.

Future research

Future research could adopt a longitudinal design to track changes in infection control practices over time, offering a more comprehensive understanding of trends and influencing factors. Conducting multicenter studies across different regions with a larger and more diverse sample would enhance the generalizability of findings and provide deeper insights into infection control practices in dentistry. Additionally, incorporating objective observations alongside self-reported data could improve the accuracy of assessments, particularly in evaluating glove usage effectiveness in dental settings. To further enhance inclusivity and capture a broader range of perspectives, multilingual surveys should be considered, ensuring that language barriers do not limit participation and representation in future studies.

Implications

The study's findings can play a crucial role in shaping healthcare policies related to infection control in dental settings by emphasizing the importance of proper glove usage and adherence to established protocols. Additionally, the results underscore the need for targeted educational programs for dental students and practitioners, focusing on effective glove use and infection control practices to enhance patient and provider safety. In terms of implications in dentistry, the study contributes to the development of evidence-based clinical guidelines tailored to the Qassim Region, addressing infection control practices in dental care settings. Furthermore, integrating these findings into professional training through dental

schools and continuing education programs can help equip future dental healthcare providers with the necessary knowledge and skills for effective infection control.

Conclusion

This study aimed to assess the effectiveness of glove use in infection control within dental practices in the Qassim Region, KSA. Employing a cross-sectional research design, data was collected from 200 participants. The study explored various aspects, including the protective efficacy of different gloves, the duration of gloves' adequate protection, the impact of double gloving, and the effect of petroleum-based products on glove integrity, among other factors. Despite the valuable insights gained, it is essential to acknowledge the study's limitations.

Future research endeavors could consider longitudinal designs with larger and more diverse samples, incorporating direct observations alongside self-reported data. This would provide a more comprehensive understanding of the dynamics of infection control practices in dental settings. The implications of this study are significant for both healthcare policies and educational programs. The findings can inform the development or refinement of policies related to infection control in dental settings, emphasizing the critical role of proper glove usage.

Moreover, educational programs can integrate these insights, ensuring that dental students and practitioners receive targeted training on effective infection control practices. In the context of dentistry, the study's outcomes hold the potential to shape evidence-based clinical guidelines specific to the Qassim Region. By addressing the nuances of infection control practices in dental care, these guidelines can contribute to a safer and more standardized approach within the profession. Furthermore, professional training programs can utilize these findings to enhance the curriculum, fostering a new generation of dental healthcare providers equipped with the necessary knowledge and skills for effective infection control.

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