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Original Article

Practices Related to Infection Control among Dental Professionals in Pakistan

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ABSTRACT

Although infection control is an integral part of dental practice, there has been limited compliance in Pakistan, which is one of the countries with the highest prevalence of Hepatitis B and C virus in the world, with only a few quantitative studies reporting the prevalence of non-compliance and providing little understanding of the reasons for non-compliance. **Objectives:** To find out the perceptions, practices, and barriers toward infection control among dental professionals in Pakistan based on the HBM. **Methods:** Twenty dentists, dental technologists, and dental technicians were purposively sampled from Lahore, Karachi, Islamabad, and Peshawar from private clinics, government hospitals, and laboratories. The data collected were semi-structured interviews and observation of the sites, and were analyzed thematically in accordance with the six-phase method of Braun and Clarke; further, NVivo 14 software was used for the analysis. **Results:** Five themes were identified: a persistent gap between knowledge and practice, systemic problems including cost, limited supplies, and time pressure, lack of communication between clinics and labs as to the status of disinfection, poor formal training, and generally positive attitudes toward infection control with inconsistent practice. Participants with formal training were more consistent in practice than participants without formal training, and the majority indicated a high level of interest in being offered future training in the event that it was available. **Conclusion:** The theoretical knowledge of dental professionals in Pakistan about infection control is satisfactory; however, the practical implementation is hindered due to cost, supply, training, and communication barriers.

INTRODUCTION

Infection control in dental practice is an integral, fundamental part of patient safety and is one of the least discussed aspects of clinical governance in developing nations [1, 2]. There are many factors associated with the nature of the work, from aerosol-generating procedures to high-speed rotary instruments and the frequent transfer of contaminating substances (such as blood, saliva, and bodily fluids) between people or from one person to another, which increase the risk of pathogens spreading from one person to another [3-5]. The blood-borne infections of primary concern to dental staff are Hepatitis B, Hepatitis C, and HIV, and the patient is at risk of contracting the infection if sterilization and disinfection are not followed properly. This is an urgent need in the context of Pakistan's disease burden: the World Health Organization estimates that an estimated 10 million people in Pakistan suffer from chronic Hepatitis C, making it the second most prevalent in the world, and Hepatitis B is estimated to impact between 2.5–4.5% of the general population [6-9]. These statistics are not abstract to the dentist who deals with contaminated materials every day, many of whom handle the material without proper precautions. The dental laboratory is in a very strange place in this chain of infection. They get hundreds of impressions, prostheses, and appliances each day that have been in the mouths of patients and could contain infectious organisms. Materials can flow through the system in either direction, from the clinic to the lab, and from the lab back to the clinic; either way, there is a risk of contamination if disinfection is not performed. The

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contamination that is designed to prevent is not theoretical; significant amounts of microbial and bacterial contamination have been found on surfaces, impressions, and prostheses in circulation in clinics and laboratories through direct sampling [10]. The study hypothesized that: (H1) dental professionals possess adequate theoretical knowledge of infection control but face significant practical barriers to implementation; (H2) formal training is associated with more consistent infection control practices; and (H3) the absence of standardized communication protocols contributes to cross-infection risks between clinics and laboratories.

While there are guidelines for infection control, a knowledge–practice gap has been observed in dental professionals in Pakistan. Less than 45% of dental laboratories routinely disinfect impressions, approximately 60% of dental technicians do not have formal infection control training, and over half of dental clinics and labs do not have written protocols. This study aimed to explore the perceptions, practices, and barriers related to infection control among dental professionals in Pakistan, to examine the role of training and written protocols in influencing infection control practices, and to investigate communication gaps between dental clinics and laboratories regarding disinfection status.

METHODS

The design of the study was qualitative phenomenological, and data were analyzed following the six phases of Braun and Clarke. The study was approved, and all participants were informed and consented; anonymity and confidentiality were assured. The study was conducted at the Dental Dexterity Clinic, Lahore, from January 2026 to March 2026. The subjects were 20 participants who were recruited by purposive sampling from various dentists, dental technologists, and dental technicians with one year of experience or above from the government hospitals, private clinics, and commercial laboratories in Lahore. The sample size of 20 was selected based on the principles of qualitative research, where data saturation the point at which no new themes or insights emerge from additional interviews is typically achieved with 15-25 participants in phenomenological studies. This sample size also allowed for adequate representation across professional categories (dentists, technologists, and technicians), practice settings (private, government, and both), and geographic locations (Lahore, Karachi, Islamabad, and Peshawar) while maintaining the depth of analysis feasible within a qualitative framework. Two types of data were gathered: semi-structured interviews and visitations to 5 sites. Interviews were conducted with an open-ended interview guide that included topics on knowledge, practice, barriers, training and communication, took 45–60 minutes, and were audio-recorded with permission and transcribed verbatim. A six-phase thematic analysis approach was used as described by Braun and Clarke [11]. Contextual detail was recorded during site visits at clinics and laboratories, including: (1) presence and storage conditions of disinfectants (e.g., sodium hypochlorite, glutaraldehyde, alcohol); (2) use of personal protective equipment (PPE) such as gloves, masks, and eyewear by staff; (3) availability and visibility of written infection control protocols or standard operating procedures; (4) layout and organization of disinfection areas, including designated zones for cleaning and decontamination; (5) general cleanliness and hygiene conditions of the workspace; and (6) presence of labeled containers and appropriate waste disposal systems. Interviews were conducted using a semi-structured interview guide developed by the research team based on the Health Belief Model (HBM) framework and informed by a review of existing literature on infection control practices in dental settings [4, 12]. The interview guide was pilot-tested with two dental professionals (not part of the main study sample) to ensure clarity and relevance of questions. Topics covered included knowledge of infection control guidelines, current practices, perceived barriers, training history, and communication between clinics and laboratories. The guide was not adapted from a single existing instrument but rather synthesized from multiple sources to address the specific contextual factors relevant to the Pakistani dental practice environment.

A six-phase thematic analysis approach was used as described by Braun and Clarke [11]. Transcripts were double-read for familiarization and then coded inductively according to participants' answers and deductively according to the research questions and Health Belief Model (HBM). Codes were clustered within the candidate themes that were examined and evaluated through comparison to the full data set for consistency and relevance. Final themes were identified, labelled and justified using exemplary participant quotes. The coding process was organized using NVivo 14. Member checking, triangulation of interview findings and observational notes, and reflexive journaling were used to ensure trustworthiness by minimizing researcher bias and identifying it.

RESULTS

Demographic characteristics of study participants (n=20), including age, gender, professional qualification, years of experience, and practice setting across four cities in Pakistan, are analyzed. Twenty people participated in the study—12 were male (60%), and 8 were female (40%). The sample comprised four dentists (20%), nine dental technologists (45%), and seven dental technicians (35%). This distribution reflects the purposive sampling strategy designed to capture varied perspectives across professional roles and practice settings rather than

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proportional representation. Years of experience ranged from less than one year to over 10 years, with the highest frequency group (40%, n=8) in the 1-5-year range. Practice settings were distributed across private (n=8, 40%), government (n=7, 35%), and both sectors (n=5, 25%). The sample was recruited across four geographic regions—Lahore, Karachi, Islamabad, and Peshawar to capture regional variation (Table 1).

Table 1: Demographic Characteristics of Study Participants (n=20)

Resp.	Age	Gender	Qualification	Experience	Practice Setting
P1	26-30	Male	Dental Technologist	1-5 Years	Private
P2	31-40	Female	Dental Technician	6-10 Years	Government
P3	20-25	Male	Dental Technologist	<1 Year	Private
P4	>40	Female	Dentist	>10 Years	Private
P5	26-30	Male	Dental Technician	1-5 Years	Government
P6	31-40	Female	Dental Technologist	6-10 Years	Private
P7	20-25	Male	Dental Technician	<1 Year	Both
P8	26-30	Female	Dental Technologist	1-5 Years	Government
P9	>40	Male	Dentist	>10 Years	Private
P10	31-40	Male	Dental Technologist	6-10 Years	Government
P11	20-25	Female	Dental Technician	<1 Year	Private
P12	26-30	Male	Dental Technologist	1-5 Years	Government
P13	31-40	Female	Dentist	6-10 Years	Both
P14	>40	Male	Dental Technician	>10 Years	Government
P15	20-25	Male	Dental Technologist	<1 Year	Private
P16	26-30	Female	Dental Technician	1-5 Years	Private
P17	31-40	Male	Dental Technologist	6-10 Years	Government
P18	>40	Female	Dentist	>10 Years	Both
P19	20-25	Male	Dental Technician	<1 Year	Private
P20	26-30	Female	Dental Technologist	1-5 Years	Government

Theme 1: The Knowledge-Practice Gap

In general, the participants had good theoretical knowledge but demonstrated inconsistent infection control practices. While most were aware of the need to disinfect impressions before sending them to the lab, they also knew that blood and saliva could cause problems, but how it really was in practice was another story. One dentist with more than 10 years of experience, working in a private setting one dentist (P4, female, >10 years' experience, working across both private and government settings) stated categorically: 'I know we need to disinfect impressions... but in reality, there is no time, patients are waiting, and the lab people are asking for the impressions to be done as soon as possible.' When discussing time pressures specifically, P4 referred to her private practice experience, noting that 'in private practice, we see more patients per day and the pressure is greater (P4). A dental technician who has earned 1-5 years of experience said the same thing: "Well, I know we should use sodium hypochlorite, but we use alcohol as it is easily available and is cheaper" (P5). Results indicated clearly that there is a gap between knowledge and practice among groups and settings. Disinfectants were available in several laboratories; however, staff were not routinely using disinfectants. This means that awareness measures are not in themselves sufficient to guarantee compliance, and practical barriers need to be tackled to ensure better infection-control measures.

Theme 2: Systemic Barriers to Effective Implementation

The participants identified several structural barriers to good infection control, including the most frequently mentioned ones being: cost, supply shortages, time pressure, and weak infrastructure. It was a dentist in private practice with more than 10 years of experience who gave the explanation on the cost issue in a simplistic way. "Sodium hypochlorite is imported and is very costly; one bottle is Rs.2000-3000, which is beyond the financial means of a middle-class clinic" (P9). A government hospital technician said a similar constraint on supply: "Disinfectants will not be received for some weeks in government hospitals; what shall we do in these hospitals? We rinse off in water and take to the lab" (P14). Another common obstacle was time pressure. One dental technologist working in a private setting it like this: "If we would disinfect each impression, we would see 30–40 patients a day for 2–3 hours, which is unacceptable" (P3). The infrastructure for infection control was found to be inadequate at most of the sites visited, most of the laboratories having no dedicated area for disinfection and many laboratories with disinfectants stored in unlabeled containers. This was particularly true of government facilities, and was also evident in private laboratories. The results indicate that awareness is not enough; appropriate resources, facilities and workload are needed to ensure sustainable infection-control practices.

Theme 3: Communication Gaps Between Clinics and Laboratories

Another major theme was communication regarding the disinfection status between clinics and laboratories. The vast majority of participants reported that they did not regularly check with the laboratory if an impression had been disinfected. A young dental technician with less than one year of experience gave his explanation for the assumption behind this: "A young dentist with less than one year of experience (P7, male, currently working in both private and government settings during his early career) explained the assumption behind this: 'It is usually assumed that the lab people will do the disinfecting.' P7 clarified that this assumption was based on his observations across both settings, noting that in neither context was there a standardized handover protocol" (P7). On the other side, a lab tech who has 1-5 years of experience explained how this can be frustrating: "Clinics don't tell us; they say that nothing we need to know, it can be disinfected; what disinfect? The researchers don't know" (P16). Cross-infection is a risk with poor communication between dental clinics and laboratories. It was discussed

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that uniform communication practices, checklists, and clear disinfection information should be implemented to further reinforce the importance of shared responsibility and the spread of infection.

Theme 4: Training Deficits and Their Consequences

The majority of participants had no formal training in infection control, with learning coming from their colleagues or through self-study. This was said directly by a dental technician working in a private setting who has less than a year of experience: No one ever trained me. I learned from my senior; he said to do it this way. He never learned anything either (P19). A technologist in private practice remembered how little formal instruction was a part of their education: "During college I got only one lecture on infection control, that was it, and during my job I didn't know how to use sodium hypochlorite" (P15). Indeed, those who had originally trained performed better across the board than those who had not. One senior dentist who had done training abroad referred to the access: "My senior consultant has a protocol because he was from the UK, but we didn't get access to it" (P18). Despite the lack of training, most participants wanted it. "I want to go for workshops; if there is any training regarding infection control in Pakistan, I will go for it for sure," one of the dentists with 6-10 years of experience said enthusiastically (P13). This calls for the development of short training programmes which are accessible and practically oriented and are tailored to the Pakistani context instead of disseminating guidelines.

Theme 5: Positive Attitudes and Willingness to Improve

The poor practices mentioned above, along with many barriers to practice, did not dampen the participants' enthusiasm for infection control, and they were unanimous in their understanding of its importance. Most agreed it was a joint responsibility of dentists and laboratories, and most strongly agreed that all impressions should be disinfected. A technologist with 6-10 years of experience in government stated this is a partnership: "It is not just the responsibility of the lab to control infection; the clinic will need to work in tandem with the lab" (P17). A dentist also highlighted the aspect of patient safety first, while delivering the message: "If I don't disinfect, the patient may get an infection. This is against my conscience" (P4). Legal exposure was also a consideration for some. One senior dentist commented that: Medical negligence cases are on the rise in Pakistan, and if a patient gets infected, a case can be filed, I'm afraid (P9). Staff were very keen to participate in training and enhance their infection control practices. Most staff knew about the importance of practical implementation but were prepared to change, if necessary, but this was not done. Future interventions should thus aim at alleviating practical barriers, making resources available, and training on infection prevention.

DISCUSSION

All of these results provide a comprehensive picture of the attitudes and practices of dental professionals towards infection control in Pakistan. The five themes identified, such as knowledge-practice gap, systemic barriers, communication gaps, training gaps, and positive attitudes, are still in addition to previous studies conducted in Pakistan and other developing countries and are further supplemented by the survey data [13-17]. Most salient was the clear gap between the knowledge and infection control practices of the participants. Similar findings of this knowledge–practice gap have been seen in other dental infection control research. A study of dental technicians and assistants in other parts of Saudi Arabia also revealed that the understanding of infection control principles did not necessarily correspond to their use in everyday practice [18]. Similar results were presented for dental technicians in Karachi who had good knowledge of the need to wear gloves and disinfect materials from dental clinics but were not following the practice, with only 8.1% using gloves routinely and 38.7% disinfecting materials received from dental clinics routinely. Cost, supply problems, time pressure, and poor infrastructure were just as much systemic barriers in the current study. Cost is a common topic in regional literature, with over half of technicians in one Pakistani study reporting that the cost of infection control measures placed a burden on their laboratory that they could not always afford to meet, and financial difficulty being cited as a major challenge in other similar studies across the region [19-21]. There have been some successful attempts to implement protocol-driven structured approaches to infection control elsewhere also, such as the triage-and-testing models in the United States tested in dental practice-based research networks, and the ramp-up in interest in infection control protocols during COVID-19 indicates that dental professionals can adapt quickly when it becomes an urgent priority [10, 19]. So, the lack of capability in Pakistan now seems less about the lack of capability than it does the lack of opportunity: Infection control information is largely acquired through informal channels, from someone close by. Nonetheless, participants were optimistic about the state of infection control, and they were clear on the importance of this, an encouraging finding that was also echoed by other studies. The Pakistani dentists responding to the survey indicated a similar profile: they expressed little awareness of formal programs, but were very enthusiastic about the concept.

The twenty participants were purposively selected and yielded highly useful information, but were not representative of the overall situation in dental practice in Pakistan. Interviews also utilized a self-report approach, and though the self-report approach was triangulated with observation, there may be some social desirability bias.

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Future studies are needed to evaluate the efficacy of similar structured, low-cost training, and standardized communication between clinic and laboratory in improving the practice of infection control in other similar settings and in measuring changes in practice.

CONCLUSIONS

Overall, this study reveals that the knowledge level of dental care practitioners regarding dental infection control is fairly high, while they are restrained by the cost, shortage of supplies, lack of training, and inadequate communication between dental clinic and lab. Despite this, participants were very motivated to improve. If disease transmission risk in Pakistani dental settings is to be meaningfully reduced, then the gap between knowledge and practice will have to be closed, which will require direct action on system issues through training, written protocols, and communication.

Author's Contribution

Conceptualization: UH
Methodology: UH
Formal analysis: UH
Writing and Drafting: UH
Review and Editing: UH

The author approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

The author declare no conflict of interest.

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