

# Infection Control Measures Among Dental Health Care Workers

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## Abstract

The aim of this study was to establish the knowledge, attitudes and behavior of infection control among dental health care workers (DHCW) in a dental hospital in Kenya. **Methods:** A descriptive cross-sectional study that used a close-ended questionnaire to collect data from a sample of 110 DHCW. Estimation of 95% confidence intervals was used to test the proportions of the knowledge levels. Data were analyzed using MS Excel. **Results:** Out of 150 DHCW, a convenient sample of 110 DHCW participated in the study, with 10 non-respondents. Female participants (58) were more than males (42); M:F = 1:1.38. Age range was 21–41 years (mean=25.7 years). Most respondents ( $n=79$ , 79%) were students aged 20 to 24 years. Overall, 46% of the participants were ill informed about infection control, 32% did not practice the recommended infection control

practices, while 39% had a negative attitude towards various aspects of infection control. **Conclusion:** These results show that infection control measures need enforcement and daily practice regularly. Continuous and compulsory training in infection control is recommended for those working in clinics.

**Key words:** Infection, Dental, Sterilization

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## Introduction

Although the transmission of infectious agents between patients and dental health care workers (DHCW) in dental settings is rare, cases of cross-contamination in dental settings, including patient-to-patient transmissions, were reported from 2003 to 2015 (1, 2). These reports highlighted the need for comprehensive training to improve the understanding of underlying principles, recommended practices, their implementation, and the conditions that must be met to prevent disease transmission (3). Infection is a major problem for health care systems in many countries. Despite advances in infection control and the emphasis placed on standard measures to follow, in recent years the problem has persisted in health care centers such as dental clinics and hospitals (4). Disease transmission can be from health care-associated infections to patients through contaminated instruments and environments, occupational hazard to DHCW through aerosol, improper handling of contaminated instruments, and accidents with sharp equipment. DHCW are at high risk of exposure to cross-infection with blood-borne pathogens such as hepatitis B virus, hepatitis C virus, human immunodeficiency virus (HIV), mycobacterium tuberculosis, streptococci, among other viruses and bacteria

that colonize the oral cavity and upper respiratory tract (5). In the health care set up, care of the instruments and work environment to prevent cross-infection is paramount. To eliminate microorganisms, instruments should be exposed to steam at a specified temperature for a specific time. Although other options exist, the preferred temperature–pressure–time relationship for all small steam sterilizers is 134–137°C, 2.1–2.25 bar gauge pressure for at least a 3-minute holding time, or steam under pressure at a temperature of 121–134°C with time depending on the size of the load (6).

The working environment requires disinfection with the recommended disinfectants in-between patients to prevent cross-infection through the aerosol. Although medical and dental societies as well as governmental organizations have issued several recommendations and guidelines, studies show that infection is not well-controlled in dental settings and hospitals in many countries (7). Even in places where infection control protocols are followed and sterilization is carried out, sterilization is not regularly monitored. Monitoring sterilization is important, otherwise standards of sterilization become questionable (8).

Many surveys have been carried out on cross-infection control procedures in several countries, but literature is

scarce on the infection control practices among DHCW in Kenya.

This study aimed to investigate the knowledge, attitudes and behavior of these workers at a dental hospital in Nairobi, Kenya. The information may be used to implement safety measures for patients at risk of cross-infection.

## Methods

This descriptive study assessed the knowledge, attitudes and practice of infection control among DHCW at a dental hospital in Kenya. Ethical approval was obtained from Kenyatta National Hospital–University of Nairobi Ethics, Research and Standards Committee. All DHCW were sensitized on the research objective. Those who agreed to participate were given a questionnaire and asked to complete it at the time it was presented to them, without referring to books or to the internet. They were supervised to ensure compliance. Those who did not comply were excluded from the study population. The questionnaire collected data on infection control practices; knowledge of sterilization, wearing gloves, wearing masks and handling white coat; and methods of disposing hazardous waste. The data were analyzed using statistical software (Microsoft Excel). Descriptive statistics and the 95% confidence intervals were calculated.

## Results

Out of 150 DHCW, 110 were included in the study: 58% female and 42% males (F:M=1:1.4) aged between 21 and 61 years (mean=25.7 years). Most of the study population were students aged between 21 and 26 years (79%,  $n=79$ ); 3% were >26 years, 9% >40 years and 9% >50 years. Most DHCW (76%) enquired about the history of any previous infectious diseases, and 24% did not; 44% (>50 years) were consistent in recording this history.

Only 5% of DHCW routinely used protective eyewear, 69% used it only when the procedure involved blood splashes. DHCW >40 years (44.4%,  $n=4$ ) and those between 26 and 40 years (75%,  $n=3$ ) were satisfied with sterilizing the hand piece by wiping it with a chemical agent. Older DHCW >50 years (77.8%,  $n=7$ ) and younger DHCW <26 years (77.2%,  $n=61$ ) were more stringent, preferring to use an autoclave to sterilize. Most DHCW (90%,  $n=90$ ) sterilized impressions going to the laboratory, but only 32% ( $n=32$ ) sterilized work coming from the laboratory.

Most of the older DHCW (>50 years) were confident about their knowledge, and 66.7% (26–40 years) admitted to having inadequate information on infection control. Infection control practice was considered satisfactory by

88.9% of the older group; 55.6% (aged >40 years), 39.2% (aged 21–26 years) and 66.7% (aged 26–40 years) were not sure. DHCW were tested on their awareness of the correct parameters for thermal and chemical sterilization. Cumulatively, only 23% ( $n=23$ ) of respondents answered correctly for chemical sterilization and 3% ( $n=3$ ) for thermal sterilization. Two-thirds of the older DHCW (>50 years) had a good grasp of the methods of chemical sterilization. While 53% ( $n=53$ ) of respondents agreed that lack of time posed a hindrance to infection control, 51% ( $n=51$ ) admitted they lacked knowledge of effective implementation. Most respondents (96%) asked for continuous education to increase their knowledge of efficient sterilization.

## Discussion

Exposure and transmission of microorganisms between DHCW and their patients is a constant occupational hazard. In this study population, 51% asked about the patient's HIV status and only 26% asked about hepatitis B exposure (Table 1).

Table 1: Documenting history of infectious disease

Regularity	Age (years)			
	21–26	>26	>40	>50
	% of DHCW documenting			
Always	26.58	0.00	33.33	44.44
1st visit only	50.63	66.67	55.56	11.11
Sometimes	16.46	33.33	11.11	11.11
Seldom	3.80	0.00	0.00	22.22
Never	2.53	0.00	0.00	11.11

The practice of asking patients about their HIV status can be explained by the perception of the high risk of contracting HIV occupationally. Similar results were obtained in Nigeria where 47.6% of DHCW rated the occupational risk of getting infected with HIV as high (9). This perception resulted in 93% of DHCW adopting extra precautions when handling HIV-infected patients, indicating improvement in infection control procedures for only a select group of patients. However, this selective practice is against the policy of Universal Precautions as it does not consider patients who are unaware of their infection status or those who attend the dental clinic and do not disclose their HIV status (10). In addition, other viruses causing serious disease such as the herpes virus and paramyxo virus could be present in saliva at levels sufficient to be transmitted from person to person through close (within 2 meters) or intimate contact with unvaccinated persons (11).

In the present study population, 100% of DHCW reported

using gloves and masks, similar to a previous study by Gachigo and Naidoo (12). In Nigeria, only 5% of DHCW wore protective eyewear, considerably lower than previously reported (58%) in Kenya (12, 13). In India, only 0.8% of the respondents used protective eyewear, a proportion much lower than reported in this study (14). This is in contrast to DHCW from developed countries, such as Australia (77.6%), Canada (83.6%) and New Zealand (66.4%), who exercised more eye protection (15–17). Reluctance to use protective eyewear in the current study could be attributed to the erroneous belief that eyewear is more useful in procedures that involve blood splashes, yet eyewear is designed to be used at all times. The DHCW explained eyewear was not comfortable, accounting for the low usage. This complacency reflects an erroneous impression that salivary secretions are not highly infectious. This is not the case: saliva contains potential pathogens in quantities sufficient to infect other individuals (18).

In the current study, only 74% of the respondents sterilized the hand pieces with steam after every use. When compared with other countries, a higher proportion of DHCW in Kuwait (94%), Canada (83.9%) and Brazil (95.9%) used steam to sterilize their hand pieces after every use (16, 19, 20) (Table 2).

Table 2: Proportion of DHCW sterilizing hand pieces

Sterilization method	Age (years)			
	21–26	>26	>40	>50
	% using method			
Cleaning by wiping	6.32	0.00	11.11	11.11
Cleaning by wiping + chemical disinfectant	16.46	75.00	44.44	11.11
Autoclave/dry heat	77.22	25.00	55.56	77.78
None	2.53	0.00	0.00	0.00

According to Miller et al., lack of sterilizing stems from the fear of damaging and wearing out the hand piece (21). Leonard et al. studied the performance of high-speed dental hand pieces subjected to simulated clinical use and sterilization. The study showed that hand pieces subjected to 1,000 cycles of clinical use and sterilization exhibited greater eccentricity and reduced performance. All models evaluated can be expected to perform for at least 500 clinical use/sterilizations, or approximately one year, if properly maintained (22). Therefore, DHCW need to use the latest hand pieces that are sturdier and that can withstand repeated heat sterilization without loss of performance.

DHCW aged >50 years were better informed about chemical sterilization, probably due to years of clinical experience in maintaining infection control. However, overall results show that only 3% (n=3) of all the respondents correctly answered the parameters for thermal sterilization. Lack of applying theoretical knowledge and minimal accountability can be attributed to the poor infection control practice. In comparison, a review done on Iranian dentists showed that >50% of dentists were well informed about infection control protocols (23). Similar studies in Egypt show that 90.9% of DHCW were informed about chemical sterilization and 72.7% about thermal sterilization (24). Results of a study done in Brazil showed that not a single respondent out of the total study population could describe how to use an autoclave correctly (20).

In our study, most (88.9%) of the nurses considered the infection control measures in place as adequate, and 57.1% of the remaining population were dissatisfied with their practice. In Nigeria 73.6% of respondents claimed their sterilization procedures were inadequate (9). Globally, differences are evident among DHCW in their knowledge of infection control and implementing protocols (Table 3). Uncertainty over sterilization protocols on the part of clinicians imposes increased responsibility on nurses in any clinical setting. All DHCW are responsible for implementing and keeping up with current infection control protocols in their hospitals and clinics.

**Conclusion**

The present study demonstrated that older DHCW were more familiar with the knowledge and practices of infection control. Overall, the practice of using personal protection devices and observing necessary procedures for infection control was not consistent. Outside the training framework, responsibility for clinical procedures falls on DHCW. To

Table 3: Comparison of DHCW in different countries implementing infection control measures

Year, Author	County	Use of gloves	Use of masks	Use of glasses	Handpiece autoclaving
		% of DHCW implementing infection control			
1994, Treasure	New Zealand	42.0	64.8	66.4	42.8
1996, Morris	Kuwait	90.0	75.0	52.0	94.0
1997, McCarthy	Canada	91.8	74.8	83.6	83.9
2002, Al Rabiah	Saudi Arabia	100.0	90.0	–	30.0
2005, de Abreu	Brazil	98.0	95.9	55.1	95.9
2009, Yuzbasioglu	Turkey	96.3	96.3	96.3	17.8
2019, Present	Kenya	100.0	100.0	5.0	74.0

eliminate the risk of cross-infection, current infection control guidelines must be implemented. The Ministry of Health released comprehensive guidelines on infection control in 2010. Implementation of these guidelines should be enforced through creating awareness (25). The interval between patient appointments should allow sufficient time to ensure efficient infection control. We recommend that DHCW be provided with continuous updates on current infection control protocols.

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