



# KNOWLEDGE AND PRACTICES OF INFECTION CONTROL OF DENTAL PRACTITIONERS IN TWO DISTRICTS OF UGANDA

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## ABSTRACT

**Objective:** To establish the knowledge, practices and needs of infection control (IC) of dental practitioners in Kampala and Wakiso districts, Uganda.

**Methods:** This was a cross sectional study carried out in Kampala and Wakiso districts. The study participants were purposively selected. The data were collected using a structured questionnaire in form of an interview.

**Results:** There were 2 practicing Dental Surgeons in Wakiso and 44 in Kampala District, while the Public Health Dental Officers were 41 and 152 in the respective districts. About 44% of the respondents did not undergo IC training in their institution and 61.9% had never had any formal continuing education in IC since qualifying from training institutions. All the respondents were aware of the possible transmission of infection during dental care. About 93.7%, 91.6% and 56.1% of the respondents agreed that HIV, HBV and HBC, respectively, could be transmitted during dental care. About 56% of the respondents were fully immunized against HBV. Most respondents adhered to personal protection: use of gloves, face masks, protective eye glasses and protective clothing. About 64% of the respondents agreed that IC measures placed an additional financial burden.

**Conclusion and recommendation:** Despite low prevalence of formal training in IC, respondents had adequate knowledge and practiced IC measures during dental care. However, IC should be included in the training curriculum and regularly reinforced with continuous professional development.

**Key words:** gloves, infection control, masks, sharps, sterilization, waste disposal

## Introduction

Dentistry is predominantly a surgical discipline, involving exposure of blood, saliva and other potentially infectious materials to the practitioners. The notable routes of cross transmission during dental procedures include needle stick and other sharps injuries, use of contaminated instruments, infective splatters and aerosols generated during various dental procedures (Leggat and Kedjarune, 2001; Harrel and Molinari, 2004).

A high standard of infection control and safety practice is necessary to prevent cross contamination and occupational exposure to infective pathogens present in the saliva, blood and expired air of infected individuals (Serb and Yeung, 1994). Infection control measures reported in previous studies (Serb and Yeung, 1994) involving general hygiene in dental facilities, appropriate "sharps" disposal, personal protective measures, sterilization or high level disinfection and hepatitis B virus (HBV) immunization remain the best defense, not only for the dentist, but also in preventing transmission of infectious agents between patients. Use of sterile disposable instruments is another alternative measure to re-sterilization. Guidelines and recommendations for infection control in dental health care settings have been developed (Center for Disease Control and Prevention, 2003), and studies suggest that these infection control procedures are now being more widely adopted by dentists (Verrusio et al., 1989) although needle stick injuries continue to occur, especially among younger dentists (Chowanadisai et al., 2000). This is particularly a concern for workplace environments given that some transmissible killer diseases such as hepatitis C virus (HCV) and human immune-deficiency virus (HIV) have no vaccines available. Over the last decade, dental practitioners were wary of treating HIV infected patients while patients were also wary of accessing care in facilities that treated HIV and/or HBV infected patients in the USA and other developed countries (Gibson and Freeman, 1996; Kataura et al., 1997) for fear of being infected.

In developed countries, dental practitioners' knowledge and practices and quality of care have developed concomitantly as a result of improvement in infection control (IC) technology, but in developing countries including Uganda, IC issues related to dental treatment have only recently been recognized as public health concerns.

Globally, data on IC in dentistry, availability of materials, equipment and training in their use, policies and standards on the IC and occupational safety in provision of dental care are generally scarce. Apart from a study (Kamulegeya et al., 2013) involving fresh dental graduates, there is no published information on IC among dental care practitioners in Uganda. The purpose of the present study was to determine the knowledge, practices and needs in IC of dental care practitioners in Kampala and Wakiso districts, Uganda.

## Methods

### Study design

This was a cross sectional study using an oral interview based on a structured questionnaire.

### Study setting

The study was carried out in Kampala metropolitan and Wakiso district. Kampala is the capital of Uganda and politically, a designated district with a daytime population of 1.72 million people (Uganda Bureau of Statistics, 2014). It has the 2 national referral health facilities (Mulago and Butabika hospitals) and a number of private and public general hospitals and clinics that offer dental care services.

Wakiso district surrounds Kampala and borders with Mukono District in the east, Mubende and Mpigi in the west, Luwero in the north and Kalangala in the south. It has a population of about 562,000 people. Wakiso district has 4 general hospitals and number of clinics that provide dental services.

**Study population**

The target population was dental surgeons (DS) and public health dental officers (PHDO) registered by their respective regulatory authorities and practicing dentistry either in Kampala or Wakiso district. The DS hold at least a Bachelor of Dental Surgery or its equivalent. They provide all types of dental care to patients. On the other hand, the PHDO hold a Diploma in Dentistry and their dental care services are limited to tooth extractions, simple tooth fillings, tooth cleaning (prophylaxis) and oral health education. There were 245 DS (registered by Uganda Medical and Dental Practitioners Council and practicing dentistry) in Uganda, with 52 in Kampala and 2 in Wakiso district. The number of PHDO (registered by Uganda Allied Health Professionals Council and practicing dentistry) in Uganda is 387 out of which 152 are in Kampala and 41 in Wakiso district.

Due to the small numbers of each category of dental practitioners, the sample size was based on population census (Israel, 1992). The dental practitioners (n=247) in the two districts were requested to participate in the study and all consented except 8 dental surgeons in Kampala leaving a total sample of 239 participants (Table 1).

**Study variables**

The independent variables included demographic characteristics (Table 1) while the outcome variables were knowledge, practices and needs of infection control.

**Data collection**

The data were collected through an oral interview based on a structured questionnaire. The questionnaire was pilot tested by administering it to 10 dental health care practitioners in Mukono District. Responses from the pilot were analyzed to assess content, validity and clarity of responses, and then modifications on the questionnaire were made for improvement.

**Ethical Considerations**

Permission to conduct the study was obtained from Uganda Christian University Research and Ethics Committee. Written consent was obtained from the study participants. During the study, the participants were treated in accordance with Helsinki Declaration (Krzyszczak and Lemmens, 2009). They were informed of their freedom to join the study or opt out at any stage they so wished and that their decision would not infringe on their future relationship with the investigators. The information recorded from the participants remained anonymous without divulging personal identities of the participants.

**Data analysis**

The collected data were entered into a computer and analysed using Statistical Package for Social Sciences Inc. (SPSS for windows, version 17, Chicago, Illinois, USA). Descriptive statistics were used to summarize the data which were presented in tables.

**RESULTS**

There were 44 practicing DS in Kampala and 2 in Wakiso District, while the PHDOs were 152 and 41 in the respective districts (Table 1). The skewed distribution of each category of the dental health professionals in the two districts necessitated pooling the data.

**Demographic characteristics**

The majority of the respondents (41.4%) were aged between 26-30 years and 65.7% were male (Table 1). Most (63.4%) respondents had practiced dentistry for 1-5 years while 3.8%, for 20 years and above.

**Table 1. The frequency distribution of dental practitioners according to demographic characteristics (n=239)**

Variable	Categories	Number	Percent
Sex of the respondents	Male	157	65.7
	Female	82	34.3
Age in years	20-25	36	15.1
	26-30	91	38.1
	31-35	56	23.4
	36-40	25	10.5
	41 and above	31	12.9

Variable	Categories	Number	Percent
District of study	Kampala	196	82.0
	Wakiso	43	18
Profession	PHDOs	193	80.8
	Dental surgeons	46	19.2
Duration in practice (years)	1-5	151	63.2
	6-10	53	22.2
	11-15	15	6.3
	16-20	11	4.6
	> 20	9	3.8
Type of practice	Public	16	6.7
	Private	223	93.3
Type of facility	Hospital	36	15.1
	Clinic	203	84.9
Highest level of education	Diploma	193	80.8
	Bachelor's Degree	39	16.3
	Postgraduate	7	2.9
Was infection control included in your training curriculum?	Yes	134	56.0
	No	105	44.0
Have you had any formal continuing education in infection control since qualifying as a dental practitioner?	Yes	91	38.1
	No	148	61.9

PHDO – Public Health Dental Officer

Most respondents were in private practice (93.3%) and in one or two dental chair health facilities (84.9%). About 84.1% had their highest level of education at the diploma level and 2.9% had a post graduate training (Table 1). Forty four percent of the respondents did not undergo infection control training in their institution and 61.9% had never had any formal continuing education in infection control since qualifying from their training institutions (Table 1).

**Knowledge and practice of infection control**

All respondents were aware of the possible transmission of infection during dental care of the patients (Table 2). About 93.7%, 91.6% and 56.1% of the respondents agreed that HIV, HBV and HBC, respectively, could be transmitted during dental care. Over 90% of the respondents were aware that gloves and face masks are important tools for IC. Most respondents were aware that protective eye wear (81%), protective clothing (87.4%), proper history taking before treatment (77%), covering patients with bibs (74.9%) can control infection during dental care (Table 2).

**Table 2. The frequency distribution of practitioners based on affirmative response to awareness of infection control in dental practice (n=239)**

Variable	Number	Percent
Are you aware of infection control in dental practice?	239	100
Does wearing gloves control infection?	230	96.2
Does wearing a face mask control infection?	221	92.5
Does eye wear control infection?	194	81.2
Does wearing protective clothing control infection?	209	87.4
Does covering patients with bibs control infection?	179	74.9
Does washing hands before and after dental treatment control infection?	141	59.0
Does use of hand sanitizers control infection?	120	50.2
Does taking full medical history before dental treatment control infection?	185	77.4
Does disinfecting hand instruments control infection?	165	69.0

Variable	Number	Percent
Does immunization against diseases control infection?	88	36.8
Does changing hand pieces between patients control infection?	118	49.4
Does changing suction tips between patients control infection?	123	51.5
Does changing dental instruments between patients control infection?	135	56.5
Does dry heat sterilization/ autoclave control infection (n=238)	227	95.0
Does chemical sterilization control infection	187	78.2
Does immersion boiling of instruments control infection	203	84.9
Does using sharp waste disposal systems control infection?	155	64.9
Does using ultrasonic cleaner control infection?	103	43.1

On the other hand, about a half of the respondents were aware that hand washing (59%), use of hand sanitizers (50.2%), chemical sterilization (50%), boiling (50%) and changing hand pieces (49.4%), suction tips (51.5%), and dental instruments between patients (56.5%) could control infections (Table 2). About 44.4% of the respondents were aware that HIV/AIDS could be transmitted through blood contact, while 14% agreed it could be transmitted through saliva (Table 3). About 13.8 % of the respondents agreed that HBV could be transmitted through blood contact and 17.6%, through saliva. Only 1% of the respondents agreed that HBC could be transmitted through blood contact.

**Table 3: The frequency distribution of dental practitioners based on affirmative response to knowledge in the mode of transmission of some highly infectious viral diseases in dental care (n=239)**

Mode of transmission	Disease		
	HIV/AIDS	HBV	HBC
Blood contact	106 (44.4)	33 (13.8)	1 (0.4)
Saliva	14 (5.9)	42 (17.6)	5 (2.1)
Needle stick	82 (34.2)	11 (4.6)	1 (0.4)
Poor sterilisation	30 (12.6)	4 (1.7)	5 (2.1)

HIV/AIDS - human immunodeficiency virus; HBV – hepatitis B virus; HBC – hepatitis B virus type C

The majority of the respondents reported to always put on gloves (97.1%), face masks (83.3%), protective clothing (77%), covered patients with bibs (74%), took full medical history (75.7%), washed their hands (78%), changed hand pieces (71.1%), suction tips (83%), used surface disinfectants (69.9%) and hand sanitizers (74.9) during dental care (Table 4). Most of the respondents always changed dental instruments between patients (95%) and used waste disposal system for sharps (90.4%). Most respondents always used surface barriers (61%) and put on eye protective wear (51%, Table 4).

**Table 4. The frequency distribution of dental practitioners according to infection control practices (n =239)**

Variable	Categories	Number	Percent
How often do you put on protective clothing?	Never	4	1.4
	Sometimes	51	21.4
	Always	184	77.0
How often do you cover patient with bib?	Never	16	6.7
	Sometimes	48	20.1
	Always	175	73.2
How often do you wash hands between patients?	Never	8	3.3
	Sometimes	47	19.7
	Always	184	77.0

Variable	Categories	Number	Percent
How often do you use hand sanitizers?	Never	56	23.4
	Sometimes	4	1.7
	Always	179	74.9
How often do you take full medical history of patients before treatments?	Never	10	4.2
	Sometimes	50	20.9
	Always	179	74.9
How often do you use surface barriers?	Never	42	17.6
	Sometimes	51	21.3
	Always	146	61.1
How often do you change handpiece between patients?	Never	3	1.2
	Sometimes	66	27.6
	Always	170	71.2
How often do you change suction tips between patients?	Never	22	9.2
	Sometimes	20	8.4
	Always	197	82.4
How often do you change dental instruments between patients?	Never	1	0.4
	Sometimes	12	4.6
	Always	225	95.0
How often do you change gloves between patients?	Never	2	0.8
	Sometimes	5	2.1
	Always	232	97.1
How often do you put on eye protective wear?	Never	42	17.6
	Sometimes	76	31.4
	Always	122	51.0
How often do you put on face mask?	Never	3	1.2
	Sometimes	37	15.5
	Always	199	83.3

Sixty five percent of respondents always disinfected impressions before pouring or delivery to the laboratory for fabrication oral prostheses. Seventy percent of the respondents always used surface disinfectants and 12.8% used ultrasonic cleaner. About 56% of the respondents were fully immunized against HBV while all the respondents reported having been immunized against the common early childhood killer diseases.

Most respondents were using autoclave (75.3%) for sterilization of dental instruments and disposed off the clinical waste by burning it in a pit (89.1%, Table 5).

**Table 5. The frequency distribution of dental practitioners according to routine practice of sterilization and handling of clinical waste (n=239)**

Variable	Categories	Number	Percent
Which sterilization procedure do you use?	Autoclave	180	75.3
	Chemical sterilization	43	18
	Boiling	154	64.4
How do you dispose off clinical waste?	Covered with soil in a pit	50	20.9
	Burned in a pit	213	89.1
	Incinerated	38	15.9

NB. Some of the respondents used more than one method of sterilization and disposal of clinical waste.

**Needs of infection control**

The majority of the respondents agreed that there is need for the mandated curriculum for training in infection control (99.2%) and enforcement of IC by the regulatory bodies (97.1%). Ninety five percent of the respondents agreed that dental equipment and materials for IC were readily available on the market (Table 6).

**Table 6. The frequency distribution of dental practitioners based on affirmative response to the perceived needs of infection control and safety (n=239)**

Variable	Number	Percent
Is there need for mandated IC training in dental curriculum?	237	99.2
Is there readily available dental IC equipment on the market?	227	95.0
Is there readily available dental IC materials on the market	226	94.6
Is there need for IC enforcement by regulatory bodies?	232	97.1
Do infection control measures place an additional financial burden on you?	151	63.2
Do you need standard operating procedure of IC in your health facility for reference?	98	41.0

IC – Infection control

About two thirds (63.7%) of the respondents agreed that IC measures placed an additional financial burden on them. Less than a half of the respondents (41%) needed standard operating procedures of IC in their health facilities (Table 6).

### Discussion

This was a cross sectional study employing quantitative data collection method through face to face interview using a structured questionnaire. The questionnaire was pretested on a small sample of dental professionals outside the study population. This pretesting exercise enabled corrections on the questionnaire which enhanced its validity (Converse and Presser, 1986).

The study sample was based on population census because of the small number of targeted population (Israel, 1992). In the present study, we recorded what was reported, which may not rule out reporting bias. Measuring compliance, practices are better observed than self reported (Jenner et al., 2006). Although with this limitation, the study gives important baseline findings regarding IC among dental practitioners in the studied districts.

Most respondents were practicing in Kampala district in support of the skewed distribution towards urban areas as previously reported (Tryon, 1974). Tryon (1974) suggested that the distribution of dental care workers is influenced by population size, per capita personal income, education, and other socioeconomic characteristics. Kampala district is a metropolitan with obviously better social services compared to Wakiso district which has more of suburban characteristics.

In the present study, the majority of the respondents were not aware that immunization is one of the major IC practices (Table 2) something that is contrary to guidelines on IC practice in health facilities (Center for Disease Control and Prevention, 2003). The guidelines require dental practitioners to know that protection can be achieved by a combination of immunization procedures, use of barrier techniques and strict adherence to routine IC procedures.

Although in the present study, respondents had poor knowledge of the specific modes of transmission of HBV (Table 3), 91.6% were aware of the possibility of its infection during dental care. The observed high value of awareness is comparable to 88% of the Turkish (Yüzbasioğlu et al., 2009) and 80.8% of the Indian dentists (Singh et al., 2012). Percutaneous exposure is the most important mode of HBV infection. In a previous study, Werner and Grady (1982) revealed that health care practitioners who sustained injuries from needle stick contaminated with blood containing both HBsAg and HBeAg had 22%-31% risk of developing clinical hepatitis. However, the frequency of needle stick injuries was not investigated in the present study.

Despite the high awareness of the possibility of HBV infection during dental care, only slightly more than half (56%) were fully immunized against HBV. This value was higher than 50.7% recorded among Nigerians (Oyinkansola and Kolo, 2003) and 48.2% in the Japanese (Nagao et al., 2008), but much lower than 80.5% in the Pakistanis dental care professionals (Khan et al., 2012). In Uganda, HBV vaccina-

tion is in most cases at a fee out of pocket or through drug promotion of pharmaceutical companies (Ziraba et al., 2010) which may partly explain the low prevalence of the vaccination in this study population. It should be noted that all the respondents in the present study were immunized against the common early childhood killer diseases in line with maternal child health policy in Uganda.

Although personal protective measures are particularly important, history taking from the patient before treatment is equally important and more so in the high HIV prevalent Uganda. Knowledge of the medical history of the patient compels the practitioner to take extra precaution regarding cross infection. In a previous Canadian study (Charbonneau et al., 2005), patients with HIV/AIDS, who had sought dental treatment since becoming aware of their sero-positive status, more than half (54%) always disclosed their HIV status to their dentists. In the present study, most (79.2%) respondents took a medical history before treatment of the patients. The reported value was comparable to 76.5% recorded in Pakistanis (Khan et al., 2012), but lower than rates between 90% and 93% previously seen elsewhere (Hudson-Davies et al., 1975; Oyinkansola and Kolo, 2003; Verrusio et al., 1989).

In the present study, 78.0% of the respondents reported to always wash hands between patients (Table 4), which is comparable to 77.4% of the dental workers in Nigeria (Oyinkansola and Kolo, 2003). Steere and Mallison (1975) indicated that hand hygiene (e.g. hand washing and hand antiseptics) substantially reduces potential pathogens on the hands and is considered the single most critical measure for reducing the risk of transmitting organisms from dental care workers to patients and vice versa. We observed 96.2% of the respondents always changed gloves between patients (Table 4), a value much higher than 42% in New Zealand (Treasure and Treasure, 1994), 70.6% in Nigeria (Oyinkansola and Kolo, 2003), 90% in Kuwait (Morris et al., 1996) and 91.8% in Canada (McCarthy and MacDonald, 1997). In Saudi Arabia, however, all dentists wore gloves (Al-Rabeah and Moamed, 2002) while in Japan, 17% (n=24) did not wear any gloves at all (Nagao et al., 2008).

In the present study, about 90% of the respondents were aware that gloves and face masks (Table 2) are important tools for infection control which indeed reflects the high prevalence of the respondents who always changed gloves between patients and who always wore face masks during dental practice: 97.1% and 83.3%, respectively (Table 4). These values are comparable to 90% recorded among Saudi dentists (Al-Rabeah and Moamed, 2002), but higher than 75% among Canadians (McCarthy and MacDonald, 1997) and Kuwait (Morris et al., 1997).

Most respondents were aware that protective eye glasses, protective clothing and covering patients with bibs can control infection during dental care (Table 2). This level of awareness was translated into work practice by a corresponding high proportion of dental practitioners who reportedly always put on protective wear and covered patients with bibs (Table 4). However, this was in contrast to a lower value of 52.7% of Nigerian dentists who reportedly used protective wear (Oyinkansola and Kolo, 2003). Cochran et al. (1989) postulated that these work practices are effective in controlling cross contamination especially via droplets, spatter and aerosols.

Steam, particularly through autoclaving; dry heat and chemicals remain the standard means of instrument sterilisation in dentistry, given that other cleaning methods are unlikely to decontaminate the dental instruments (Sanchez and MacDonald, 1995). In the present study, 75.3% used autoclave; 18%, chemicals and 64.4%, immersion boiling to sterilize dental instrument (Table 4). These values are at variance with other studies (Bellissimo-Rodrigues et al., 2009) where 14.1% and 80% of the Brazilian dentists used autoclave and dry heat sterilization, respectively. In Nigeria, 84.1% and 19.3% of the respondents used autoclave and immersion boiling, respectively (Oyinkansola and Kolo, 2003). In spite of the popularity of immersion boiling, it is ineffective and unsatisfactory method for sterilizing instruments (British Dental Association, 1996).

We found that 71.1% of the respondents always changed handpieces between patients after disinfection (Table 4), which was much lower than 88.2% among the Saudi dentists (Al-Rabeah and Moamed, 2002). Previous studies (Chin et al., 2006; Herd et al., 2007) revealed

that during dental procedures there is a potential for handpieces to retract oral fluids into their internal compartments. With this apparent risk in mind, it would be important to run the hand piece outside the patient's mouth to flush out the retracted fluids. We recorded changing of suction tips in 82.4%; used instruments, 94.1% and waste disposal systems for sharps in 90.4% of the respondents (Table 4). However, among the Saudi dentists, changing of suction tips was reported in 100%; used instruments in 98% and sharps disposal in 56.2% (Al-Rabeah and Moamed, 2002).

Most respondents agreed that there is need for the mandated curriculum for training in IC (Table 6), which corroborates previous reports (Chan et al., 2008); Mann and Wood, 2006; Puttaiah et al., 2009). Although most respondents had adequate knowledge (Table 2) and followed IC measures during dental care (Table 4), slightly more than half had acquired it during training in institutions and only 38.1% had formal continuing dental education since qualifying (Table 1) implying that the rest could probably have got the knowledge and practices from peers.

About 95% of the respondents agreed that dental equipment and materials for IC were readily available on the market (Table 6), which is higher than 39% and 83% reported in Asia and USA, respectively (Puttaiah et al., 2009). About two thirds of the respondents agreed that IC measures placed an additional financial burden on them (Table 6), similar to what has been reported in Asia and USA (Puttaiah et al., 2009). Less than a half of the respondents (41%) had standard operating procedures of IC in their health facilities (Table 6) an indication of the low priority placed on the guidelines.

### Conclusions and recommendations

Despite lack of formal training in infection control for most respondents, they generally had adequate knowledge and practiced infection control measures during dental care. It would however, be important to include infection control in all mandated training curricular as previously recommended (Chan et al., 2008); Mann and Wood, 2006; Puttaiah et al., 2009) and regularly reinforced with continuous professional development. There is need to sensitize dental practitioners on the importance of immunization against the highly infectious hepatitis B virus disease.

### Authors' contributions

KRS and CMR contributed to the design of the study. CMR did the analysis of the data. All authors contributed to the preparation of the manuscript and approved the final version.

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### Competing interests

The authors declare that there are no competing interests.

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