

Knowledge, attitude, reported behaviour and perceived challenges to adhering to infection control measures in dental practice among dental practitioners in Tanzania

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Running title: Infection control measures: knowledge, attitudes, reported behavior

Christian M. and Kikwilu EN: Knowledge, attitude, reported behaviour and perceived challenges to adhering to infection control measures in dental practice among dental practitioners Tanzania. *Tanz Dent J* 2014, 18(2), 64-71

Abstract: *Aim:* The aim of this study was to investigate the knowledge, attitude, reported behavior and the perceived barriers to routine use of infection control measures in dental practice among dental practitioners working in government dental clinics in Tanzania mainland. *Methods:* A 56 items questionnaire on knowledge, attitude, practices and perceived barriers to infection control was mailed to all dental practitioners working in government dental clinics in Tanzania mainland. The data was analyzed with SPSS program using descriptive statistics. *Results:* Of 177 mailed questionnaires, 125 were returned (70.6% response rate). Male respondents were 77.6%. Over 90% were knowledgeable on, and had positive attitude towards different infection control measures. Only 15.9% reported to had sterilized a bur, 42.8% to have sterilized an excavator always before using in patient's mouth during the past one month; and 53.2% washed hands with soap before and immediately after treating each patient always during the past one month. Finances and having too many patients to attend to, were reported barriers to routine adherence to infection control measures. *Conclusion:* From this study it can be concluded that the dental practitioners working in government dental clinics in Tanzania were knowledgeable on, and displayed positive attitudes towards different infection control procedures in dental clinics, although displayed very low to low levels of adherence to most infection control procedures. Reported reasons for failure to adhere to infection control procedures were financial and having too many patients to attend to. It is recommended that a mechanism to ensure that dental practitioners are routinely adhering to the infection control procedures should be put in place and further studies are recommended on this area of oral health care to improve quality of oral health services in Tanzania

Key words: infection control, dental practice, Tanzania

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Introduction

Infection prevention and control is essential to every encounter with a patient in a health care setting. Improper hand cleaning, contaminated instruments, improper protective attire and lack of immunization of the health care worker all carry the potential to lead to disease transmission (1). Pathogens that can be transmitted in dental practice include mycobacterium tuberculosis (TB), syphilis, hepatitis B (HBV), hepatitis C (HCV) viruses (2,3) including human immunodeficiency virus (HIV) (2,4,5).

The major route of transmission of HBV, HCV and HIV is via blood and body fluids of an infected person coming into contact with blood stream of a non-infected person (2,3,6). TB on the other hand

is transmitted through inhaling droplets carrying mycobacterium tuberculosis. *M. tuberculosis* is carried in airborne particles, called droplet nuclei, of 1– 5 microns in diameter. Infectious droplet nuclei are generated when persons who have pulmonary or laryngeal TB disease cough, sneeze, shout, or sing (7). A single sneeze, for example, can emit as many as 40,000 infectious TB particulates. Both pathogens can be transmitted in dental clinics' environment (8,9), and are prevalent in Tanzanian population (10-14). The Tanzania national average for HIV prevalence as by 2012 stood at 5.1% (8), while that of tuberculosis in the same year was estimated to be 84,000 cases with 95% confidence intervals of 45000-140000. The incidence was estimated to be 79000 (74000-84000) cases, with mortality rates of 6100 (3200-

9900) per 100,000 people (9). The average prevalence of HBV, HCV and syphilis stand at around 9%, 1% and 5%, respectively (10-14).

Sharps injuries are common in dental practice and may allow transmission of blood-borne viruses. The transmission rates of hepatitis B (HBV) to non-vaccinated recipients, hepatitis C (HCV) and human immunodeficiency virus (HIV) after a needle stick injury are 6-30%, 2.7-10% and 0.1-0.3% respectively (2). Although the risk of HIV infection after percutaneous exposure is about 0.3%, the importance of preventing its occurrence is of paramount importance. Mucous membranes can also act as an entry point for pathogens. In a recently published report on risk of contamination of the face of the dentist during different dental procedures, the eyes, and nose were the most contaminated areas of the face, indicating the potential risk of acquiring infection during the dental practice (15). The risk of transmission of HIV virus through mucous membranes coming into contact with blood of infected person is 0.09%, while that of HBV and HCV is not well documented (16). This calls for active and conscious practicing of infection control measures in all health care settings particularly in dental health settings where most of the procedures involve contact with saliva and blood, and produce aerosols. Active and conscious practicing of infection control in dental care settings require adequate knowledge of the standard infection control measures and precautions as well as positive attitude towards infection control (17,18).

Infection control in dental practice is a common concern in all countries, and many reports show deficiencies in compliance to infection control protocols. In Iran for example, an extensive literature review process included 698 articles from 1985 to 2012. The results of this review indicated inappropriate knowledge, attitude, and practice regarding infection control among Iranian dentists and dental students. Using personal protective devices and observing measures required for infection control were not in accordance with global standards (19).

In India, a study of infection control among dental students indicated poor knowledge, attitude and practice, with a positive correlation between attitude and practice. The authors recommended rigorous training on infection control measures prior to graduation and mandatory hepatitis B immunization of students before exposure to clinical practice (20). In Nigeria, good infection control practices were adopted by 89.9% of dentists (21).

In a study conducted by Matsuda et al in Brazil 62% of participants measures admitted that surface protection barriers were not used, whereas 34.17% were using non ideal or outdated pre-disinfection measures. The autoclave was used by 69.38% of participants, although 33.80% were not monitoring control of the sterilization cycles. These reported findings indicate deficiencies in knowledge, attitudes and practice of infection control in dental clinics (22). A review of studies published between 1990 and 2007 in South Africa, indicated serious shortcomings with regard to infection control measures in oral health care facilities (23). Given the widespread of infectious diseases globally and the potential risk of spreading infections through dental practice, there is a need to rigorously find ways of improving infection control in dental practice.

In all regional and district dental officers' meetings in Tanzania, at least, there has been some form of continuing education on infection control measures. Likewise, in several Tanzania Dental Association (TDA) meetings topics on infection control have been addressed and resolutions aiming at observation of infection control measures made. It is not known as to what extent has the continuing education through meetings penetrated to all dental health care workers in Tanzania. Until the time of preparation of this research work, the authors could not find published reports or government documentation of the level of knowledge, attitude and infection control measures among Tanzanian dental practitioners.

Understanding the level of knowledge, attitudes and infection control measures of dental practitioners is important because the information can be used to: 1) indicate the level of infection control in Tanzania, 2) initiate continuing education to oral health care workers, 3) call upon the need for developing the national policy on infection control in dentistry, and 4) reassure patients using dental services in Tanzania. The aim of this study was to document the *knowledge*, *attitude*, reported *degree of adherence* to infection control among dental practitioners, and the *perceived challenges* to routine use of infection control measures in dental practice in Tanzania.

Subjects and methods

This was a descriptive, cross-sectional study. Data collection was done through mailed questionnaires to all dental practitioners working in government dental clinics in Tanzania mainland whose mailing addresses were available at the time of undertaking this study.

Questionnaire used for data collection

An English version self-administered questionnaire was developed and tested for clarity among 20 dental practitioners who were working in government dental clinics in Dar es Salaam city before it was distributed to all dental practitioners working in government dental clinics in Tanzania mainland. The questionnaire had four parts: knowledge, attitude, degree of adhering to, and perceived challenges for adhering to routine infection control measures in dental practice. The *knowledge* part of the questionnaire consisted of sentences stating that a particular infection control procedure/measure was necessary e.g. "It is necessary to put on clinical coat every time you are attending to patients". The response options were "yes" and "no". The respondent was requested to tick one option which he/she thought was correct. The *attitude* part of the questionnaire consisted of questions that explored the perceived importance of a particular infection control measure such as "How important is it to put on clinical coat whenever you attend to each patient?" The responses were "very important, slightly important, and not important".

The third section explored the *degree of adhering* to infection control measures using questions such as "How did you manage to put on your clinical coat during the last four weeks?" The responses were a) I managed to put on my clinical coat all time and for each patient I attended, b) I managed to put on my clinical coat about three quarters of the procedures I attended to patients, c) I managed to put on my clinical coat only in about a half of the procedures I attended to patients, and d) I managed in less than a half of my procedures to have clinic coat on.

Those who reported adherence of less than "all times" were requested to list the challenges they faced during their endeavor to adhere to infection control protocol, using questions like "What were the likely barriers to putting on your clinical coat during all procedures you attended patients". The response options were a) I had only one coat, and sometimes it became dirt, b) it sometimes became too hot to put on the clinical coat, c) it is not part of the regulations for managing patients, d) I simply forget to put on my clinical coat, e) I sweat a lot when I put on my clinical coat.

In addition, sex and working experience of dental practitioners were enquired. No attempts were made to record working places and qualification to improve anonymity, and thus ensuring that participants were filling in what they perceive and practice without fear.

Data management and analysis

Data entry, processing and analysis were carried out using statistical package for social services (SPSS) version 15.0. Frequency distribution of respondents by responses to each item in the questionnaire was generated. Cross tabulations of the item responses with sex and working experience were generated. Chi-square tests with significant level set at 0.05 was used to identify any relationship between item responses with sex and working experience.

Ethical issues

Ethical clearance to conduct the study was obtained from ethical committee of the Muhimbili University of Health and Allied Sciences. A copy of a letter of acceptance to conduct the study from the Chief Dental Officer was attached with the questionnaire. For confidentiality reasons, the questionnaire had no slots for name of respondent, clinics s/he was working, and qualification.

Results

A total of 177 questionnaires were mailed to dental practitioners in all regional and district dental clinics using the deployment list of 2008 obtained from the Central Oral Health Unit of the Ministry of Health and Social Welfare. One hundred and twenty five questioners were returned giving a response rate of 70.6%. Only 28 (6.4%) of respondents were females. Fifty eight (48.3%) had working experience of 5 years or less. There were no statistically significant differences in *knowledge, attitude, reported behaviour* and *the perceived barriers* to routine use of infection control measures in dental practice among dental practitioners by working experience and sex. Therefore the results do not show associations between the dependent and independent variables.

Table 1 shows the percentages of 125 dental practitioners who agreed that a particular infection control procedure was necessary, and their attitude towards a particular infection control measure. Putting on a clinical coat every time before attending to patients; washing hands with soap before and immediately after treating each patient; and putting on a new pair of gloves for each patient to be attended were reported to be necessary by more than 95% of respondents. Sterilization of dental instruments was reported to be necessary by more than 93%. Drying hands with fresh towel immediately after washing hands, and putting on a fresh mask whenever attending to patients, were reported to be necessary by 87.9% and 85.5% respectively. Overall, dental practitioners displayed positive attitude towards different infection control procedures, ranging from 81.5% for putting on fresh mask whenever attending to a patient; to

96.6% for sterilizing hand pieces between each patient.

Table 1 Percentages of participants (n=125) who agreed that a particular infection control procedure was necessary and their attitude towards the same

Statements on Infection control procedures	Knowledge % agreed	Attitude positive	neutral	negative
1. It is necessary to put on clinical coat every time you are attending to patients	98.4	95.2	4.0	0.8
2. It is necessary to wash hands with soap before and immediately after treating each patient	95.2	94.4	4.0	1.6
3. It is necessary to dry hands with a fresh towel immediately after washing	87.9	86.3	6.5	7.3
4. It is necessary to put on new pair of gloves for each patient you attend	95.2	96.0	3.2	0.8
5. It is necessary to put on a fresh mask whenever attending to a patient	85.5	81.5	15.3	3.2
6. It is necessary to sterilize the hand piece between each patient you treat	93.5	96.7	3.3	0.00
7. A probe must be sterilized before using in patient's mouth	95.9	95.9	4.1	0.00
8. An excavator must be sterilized before using in patient's mouth	95.2	93.4	6.6	0.00
9. A bur must be sterilized before using in patient's mouth	95.9	95.1	4.1	0.8
10. An extraction forceps must be sterilized before using in patient's mouth	96.7	96.0	3.2	0.8

The percent distribution of dental practitioners by how feasible it was to practice a particular infection control procedure in their clinics is shown in Table 2. Two thirds or more of dental practitioners reported that infection control procedures were very feasible to undertake in their clinics. The highest proportion was on putting on clinical coat (95%), and lowest proportion was about putting on fresh mask (60.5%).

Table 3 shows the percentage distribution of dental practitioners by reported level of adherence to a particular infection control procedure. Ninety five percent and 91.1% of dental practitioners respectively reported to had sterilized extraction forceps before using in patient's mouth and put on new pair of gloves always when they attended patients during the past one month. Always sterilizing an excavator and a bur before use in a patient's mouth was reported by 42.8% and 15.9% of the dental practitioners respectively.

The reasons for failure to adhere to infection control measures were reported to be financial constraint, too many patients to attend to, and a feeling that the procedure was not necessary. Failure to put on clinical coat all the time was ascribed to having one coat and sometimes it

became dirt, hot weather and sometimes one simply forgot to put on a clinical coat.

Discussion

This study used mailed questionnaires to dental practitioners who were working in government dental clinics in mainland Tanzania. No attempts were made to record working places and qualification to improve anonymity, and thus ensuring that participants were filling in what they knew, perceived and practiced without fear. This was perceived by authors as strength of the study because the importance of infection control in dentistry have been repeatedly stressed in dental professional meetings to the extent that if a dental practitioner was noted to violate the infection control measures would be labeled as rebellious. The response rate of 70.6% was perceived as acceptable range for mailed questionnaires. Therefore, the authors are convinced that the results of the current study reflect the knowledge, attitudes and practice of the dental practitioners who were working in government dental clinics of mainland Tanzania in the year 2009. The non-respondents characteristics were not assessed. Therefore it is difficult to point the direction of bias caused by non-respondents. In this case, interpretation of the results needs to take into consideration of the shortfalls of mailed questionnaires data.

Table 2 Percentages of participants (n=125) by reported feasibility of practicing a particular infection control procedure

Infection control procedure	Feasibility (%)		
	Very feasible	Slightly feasible	Not feasible
1. Putting on clinical coat every time you attend to patient	95.0	5.0	0.0
2. Washing hands with soap before and immediately after treating each patient	79.5	17.2	3.3
3. Drying hands with a fresh towel immediately after washing	69.9	22	8.1
4. Putting on new pair of gloves for each patient you attend	92.7	6.5	0.8
5. Putting on a fresh mask whenever attending to a patient	60.5	29.0	10.5
6. Sterilizing the hand piece between each patient you treat	73.4	20.1	6.5
7. Sterilizing a probe before using in patient's mouth	94.3	4.9	0.8
8. Sterilizing an excavator before using in patient's mouth	90.2	8.2	1.6
9. Sterilizing a bur before using in patient's mouth	88.7	10.5	0.8
10. Sterilizing an extraction forceps before using in patient's mouth	92.7	6.5	0.8

In addition, the degree of adherence to a particular infection control practice during the past one month needs to be interpreted with reservations because the number of procedures done during the past one month was not recorded. Therefore, the degree of adherence to a particular infection control procedure cannot be adequately compared between practitioners who attended one particular procedure in a day to those with a busy clinic, who attend 10 or more such procedures in a day. Those who undertook few procedures could easily meet the requirements of infection control than those with busy clinics.

The fact that over 85% of the respondents agreed that the infection control procedures studied were necessary indicate that majority of dental practitioners in government dental clinics in mainland Tanzania are knowledgeable about infection control procedures in dental practice. Continuing education on infection control measures conducted in regional and district dental officers' meetings and in Tanzania Dental Association (TDA) meetings are likely to be useful. In addition, during the formal training of dental practitioners the aspects of infection control in dental practice is likely to have been adequate because not all dental practitioners in Tanzania get an opportunity to attend the continuing education and professional

development courses. Lower proportions of dental practitioners with knowledge on infection control procedures were reported in India by Morandi Khanghahi et al 2013 (19), in among Iranian dentists by Askarian M, and Assadian O. (2009) (24) and in South Africa by Oothisen et al 2010 (23). In an extensive study that compared dental practitioners' knowledge, attitudes and practice of dental safety at the turn of the century from eight countries: India, Pakistan, Thailand, the Philippines, Taiwan, China, South Korea and USA, only a little over 50% of practitioners were reported to understand and practice Universal/Standard (UP/SP) precautions effectively (25).

The high proportion of dental practitioners who had positive attitude towards different infection control procedures reported in the current study indicate that at face value, majority of dental practitioners studied would like to practice infection control procedures. Similar proportions of dental practitioners with positive attitudes towards infection control procedures were reported in India by Morandi Khanghahi in 2013 (19), in Iran by Askarian N and Assadian O in 2009 (24). The same proportions were reported among dental students in India by Singh et al 2011 (20).

Table 3 Percentages of participants (n=125) by reported degree of adherence to a particular infection control practice during the past 1 month

Infection control procedure	Degree of the adherence to a given practice		
	Always	often	rarely
1. Putting on clinical coat every time you are attending to patients	97 (77.9)	21 (16.4)	7 (5.7)
2. Washing hands with soap before and immediately after treating each patient	67 (53.2)	35 (28.2)	23 (18.6)
3. Drying hands with a fresh towel immediately after washing	54 (43.5)	34 (27.0)	37 (29.6)
4. Putting on new pair of gloves for each patient you attend	114 (91.1)	8 (6.5)	3 (2.4)
5. Putting on a fresh mask whenever attending to a patient	44 (35.2)	23 (18.0)	58 (46.7)
6. Sterilizing the hand piece between each patient you treat	65 (52.0)	21 (16.8)	39 (31.2)
7. Sterilizing a probe before using in patient's mouth	78 (62.5)	27 (21.2)	20 (16.3)
8. Sterilizing an excavator before using in patient's mouth	54 (42.8)	20 (15.7)	73 (58.5)
9. Sterilizing a bur before using in patient's mouth	20 (15.9)	17 (13.8)	88 (70.3)
10. Sterilizing an extraction forceps before using in patient's mouth	119 (95.2)	4(2.8)	3(2.0)

Majority of dental practitioners were of the opinion that the infection control procedures were feasible. This indicated that there is high chance of adhering to the infection control protocols. Putting on a fresh mask for every new patient, drying hands with fresh towel whenever attending to a new patient and sterilizing hand pieces were perceived by 10.5%, 8.1% and 6.5% respectively as not feasible. This is likely to be due to unavailability of resources, because many government dental clinics have shortages of dental supplies. For hand pieces, it is likely to be due to the fact that in most government clinics there is one working hand piece per clinic. Likewise, there may be dental clinics that have handpieces that cannot withstand heat sterilization. Given the high potential of transmitting infectious material through using unsterilized handpieces, there is a need to ensure that clinics have a good number of working hand pieces that can resist heat to allow for sterilization. We could not retrieve published reports on feasibility of undertaking different infection control procedures in dental practice. This is therefore the first study on the perceived feasibility of undertaking infection control procedures in dental practice.

The fact that 94% and 91.1% of dental practitioners reported to have sterilized extraction forceps and put on new pair of gloves whenever attending to a new patient indicate that there are still some dentists who extract teeth with unsterilized forceps and or reusing gloves. This poses a risk of cross

infection in dental practice. The situation was worse in restorative care whereby only 15.9% and 54.2% of dental practitioners respectively reported to have sterilized a bur and hand piece every time they used in a patient during the past one month.

Comparing the level of knowledge, perceptions and practice, there is an obvious down fall of percentages of dental practitioners who adhered to a particular infection control during the last month. This indicates that knowledge is not a sufficient driver for practicing infection control in dental practice among dental practitioners in Tanzania. There must be other factors that influence the adherence to infection control practice. This calls for more studies to identify factors associated with adherence to infection control measures in Tanzania. Warm temperature in dental clinics, having only one coat and negligence were among the reasons that dental practitioners' reported to have lead them not to put on clinical coats whenever they attended to patients during the last one month. Failures to adhere to other infection control measures studied were ascribed to difficulties with finances, too many patients to attend to, and feeling that the infection control procedure was not necessary. Sterilizing a bur was perceived as not necessary by 45.3% of dental practitioners. This indicated that dental practitioners were not convinced that cross infection can occur by drilling a cavity in a decayed tooth with unsterilized bur.

The low adherence to infection control in dental practice has been documented by Matsuda et al 2011 in dental practices in the municipality of São Paulo in Brazil (22), in USA and seven Asian countries (25). In their systematic review of studies conducted in South Africa during the period of 20 years, Oosthuysen and colleagues concluded that the infection control measures in South Africa fell short of the universal standards (23). This indicates that there is a need of improving infection control in dental practice in Tanzania, just as it is globally.

Conclusion

From this study it can be concluded that the dental practitioners working in government dental clinics in Tanzania

- were knowledgeable on infection control procedures in dental practice;
- displayed positive attitudes towards different infection control procedures in dental clinics;
- perceived that majority of infection control procedures were feasible in their dental clinic environment
- displayed very low to low levels of adherence to infection control procedures except sterilizing forceps (95.2% adherence) and putting on a new glove (91.1% adherence), and
- faced financial and heavy workload challenges hindering adherence to infection control procedures in their practice

Recommendations

It is recommended that

1. mechanism to ensure that dental practitioners are routinely adhering to the infection control procedures need to be put in place, and
2. further studies are recommended on this area of oral health care to improve quality of oral health services in Tanzania

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