

# Assessment and Perception of Infection Control Practices of Dental Health Care Providers Working in Tertiary Care Hospital Settings

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## ABSTRACT

**Background/objectives:** The current study was undertaken to examine the current status of dental hygiene practices of DHCWs in public sector tertiary care facilities and to generate information helpful for the implementers to improve infection control practices in healthcare facilities.

**Methods:** This cross sectional study was conducted in NID (Nishtar Institute of Dentistry) and MMDC (Multan Medical and Dental College) in Multan to assess the infection control practices of Dental Health care providers. DHCW were interviewed randomly to assess the infection control practices they followed.

**Results:** The perception pattern of the participating healthcare professional. More than 92% of the doctors agreed to the fact that personal protective equipment act as a barrier against infections. Majority of doctors (97.6%) agreed that dental hospital can be a source of transmission of HBV, HCV, TB and HIV. Most of the doctors agreed that special precautionary measures such as double gloves, masks, special gowns and double sterilized instruments should be taken while treating HBV, HCV and HIV patients.

**Conclusion:** Infection control practices, majority of the dentists used PPEs such as gloves and facial masks. There is a need for more training programs and continuous surveillance audits for the proper utilization of equipment.

**Keywords:** Infection control practices; Dental health care workers; Personal protective equipment; Sterilization

## INTRODUCTION

Infection control (IC) is one of the core responsibilities of dental health care personnel (DHCP). The natural flora of our mouths consists of a large number of microbial agents. Since dental procedures may involve the spread of blood and saliva, then infection control must be a primary practice of dentistry. Bacterial aerosols spread through the whole dental room during dental procedures which is a matter of concern. Due to these growing concerns, dentists should use proper personal protective equipments (PPE), such as “gloves, facial masks and eye protection” during their daily routine practices so that their exposure to blood borne pathogens could be decreased [1,2].

Health care providers have to deal with different types of infected patients who are suffering from communicable as well as non-communicable diseases. Different kinds of infectious diseases are

commonly seen in hospitals and healthcare institutions. Transfer of infectious microorganisms from one person to another person in clinical environment is defined as cross infection. Health care professionals, their assistants and patients are at risk of acquiring infections in a health care facility [3].

Dental hospital and clinics, like any other health care facility, is also an environment where transmission of infectious agents can easily occur. Dentists are commonly exposed to the “blood borne as well as droplet infections (salivary infections) [4].

Prevention of these cross infections in dental hospitals and clinics is a growing concern for dental practice. By adopting principles of infection transmission control and disease control practices, dental practitioners may be able to prevent and control these cross infections. Infection transmission in the dental procedures can occur through many routes which include: direct contact

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with blood, oral fluids, or other secretions; indirect contact with contaminated instruments, operatory equipment, or environmental surfaces; and contact with airborne contaminants present in either droplet splatter or aerosols of oral and respiratory fluids [5].

Studies have shown that these health care workers always took a medical history of each patient regardless of the infectious status before doing any procedure and treatment and always had used sterile gloves, face masks for every patient during dental procedures [6]. The standard precautions particularly include; (i) Hand Hygiene, (ii) Use of personnel protective equipment, (iii) Safe Injection Practices/Prevention of Needle stick/sharp Injuries, (iv) Disinfection and Sterilization, (v) Environmental Cleaning and (vi) Waste Management. For the disposal of sharp handling items such as, dental needles and disposable surgical utensils, closed containers are recommended as a tool for safe disposal of clinical wastes [7].

The current study was undertaken to examine the current status of dental hygiene practices of DHCWs in public sector tertiary care facilities and to generate information helpful for the implementers to improve infection control practices in healthcare facilities.

## METHODS

### Study design

This cross sectional study was conducted in NID (Nishtar Institute of Dentistry) and MMDC (Multan Medical and Dental College) in Multan to assess the infection control practices of Dental Health care providers. DHCW were interviewed randomly to assess the infection control practices they followed.

### Inclusion criteria

All qualified Dental professionals working in surgery, orthodontics, periodontic, prosthetics and operative departments where they were directly in contact with the patients coming for treatment

### Exclusion criteria

- i. Doctors who were not directly in contact with the patients visiting for treatment.
- ii. On leave doctors, doctors doing emergency procedures during the study period and who refused to be a part of the study were excluded.
  - Those not giving consent for participation.

### Data collection tool

A self-administered questionnaire and observational checklist for infection control practices, according to standard of precautions by CDC/WHO were used.

### Data security and quality management

For maintaining confidentiality of data, identification numbers were assigned to each respondent. For quality of the data collected training of the data collectors was done and also the principal investigator supervised the data collectors and checked the data collected on daily basis for any discrepancies or errors.

### Data analysis

All the data was entered and analyzed by statistical package, SPSS

version 20. Descriptive statistics included reporting of means and standard deviations for the quantitative variables like age, years of experience and no. of the patients attended per day. Frequencies and percentage were calculated for categorical variables like perceptions and practices.

Chi-square test was applied to compare the outcomes with respect to gender and educational level. P-values equal or less than 0.05 was considered as significant.

### Ethical considerations

- Ethical approval was taken from Institutional Review Board (IRB) Health Services Academy, Islamabad.
- Written informed consent was taken from study participants.
- Confidentiality of respondents was maintained
- Anonymity and privacy of the data was assured.
- There are no direct benefits of participation in study but study results can drive efforts towards implementation of infection control practices.
- All the researchers had followed the ethical guidelines given in WMA Helsinki Declaration.

## RESULTS

The study included a total of 170 dentists who fulfilled inclusion criteria of this study of which 88 (51.8%) were males and 82 (48.2%) were females. Mean age of the study cases was  $31.99 \pm 6.33$  years. The study results have indicated that majority of our study participants 138 (81.17%) were in the age groups of 25-35 years of age. Majority of our study participants were having BDS qualification (70.6%) followed by MCPS and FCPS degrees.

Stratification of educational level was done with respect to the gender and it was observed that there is no significant difference of qualification with regards to gender because  $p > 0.05$  ( $p = 0.346$ ) but stratification of educational level with respect to the age showed that there was significant association between ages and educational level as age group 25-30 years of age contained 66 BDS degree holders, 04 FCPS and 18 with MCPS degree. Age group 31-35 years of age contained 26 BDS, 16 FCPS and 08 MCPS, age group 36-40 had only 12 BDS, age group 41-45 had 10 BDS and only 02 MCPS and only 06 BDS and 02 FCPS were having age more than 45 years. ( $p = 0.047$ ) (Figure 1).

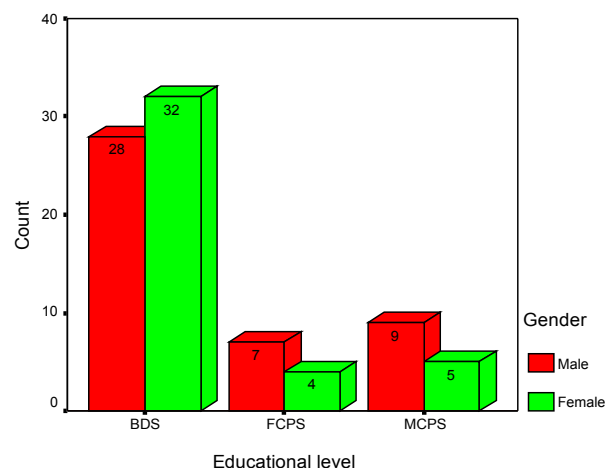


Figure 1: Stratification of gender with respect to educational level.

Table 1 show that perceptions regarding spread of infections and infection control were good and majority of the doctors agreed to the special precautionary measures to be adopted in this regard. The perception pattern of the participating healthcare professional. More than 92% of the doctors agreed to the fact that personal protective equipment act as a barrier against infections. All (100%) the doctors agreed to the fact that PPE provide good source of protection for both patient as well as for doctor.

Further it is evident from the Table 2 that majority of doctors (97.6%) agreed that dental hospital can be a source of transmission of HBV, HCV, TB and HIV. Most of the doctors agreed that special precautionary measures such as double gloves, masks, special gowns and double sterilized instruments should be taken while treating HBV, HCV and HIV patients. About 54.1% of the doctors agreed that HIV patients should be treated in special clinics while 45.9% disagreed to the fact. Steam sterilization by autoclave was first choice of 77.6% of the doctors and 22.4% preferred dry sterilization of hot air oven.

The results of Table 2 show that 90.6% of the doctors agreed that

healthcare workers should be vaccinated against polio, measles, mumps, influenza, tetanus and hepatitis B. one hundred and two (102) (60%) of the doctors reported that Zygoma and inner corner of eye are most commonly contaminated areas and 96.5% agreed that droplet infection can be saved by using PPEs such as respiratory masks and eye protective shield. Majority (90.6%) of the doctors agreed that medical history of each patient should be taken prior to the treatment to avoid any possible exposure to the infections (Table 1).

The results of the study have also highlighted the possible hurdles which could be manifested regarding poor compliance with standard precautions and 90.6% of the dental health care professionals agreed that cost, shortage of resources and large number of patients are the main contributing factors (Table 1).

Male gender agreed significantly ( $p=0.01$ ) that PPE are good barrier for infection control as all 88 (100%) agreed to this perception while 70 (85%) female doctors agreed to it and 12 (15%) disagreed ( $p=0.01$ ).

**Table 1:** Pattern of perceptions of dental practitioners.

Perception pattern	Agreed	Disagreed	Total
PPE* as barrier of infection	158 (92.9%)	12(7.1%)	170
Use of PPE for doctor and patient safety	170(100%)	Nil	170
Spread of infection by dental hospitals	166(97.6%)	04 (2.4%)	170
Special precautions for HBV,HCV&HIV patients	160(94.1%)	10(5.9%)	170
Special processing of HIV cases instruments	138(812%)	32(18.8%)	170
HIV patients treatment in special clinics	92(54.1%)	78(45.9%)	170
Steam sterilization better than dry	132 (77.6%)	38 (22.4%)	170
Vaccination of healthcare workers	154 (90.6%)	16 (9.4%)	170
Zygoma as contaminated area	102 (60%)	68 (40%)	170
PPE barrier against droplet infections	164(96.5%)	06(3.5%)	170
No need of vaccination if using PPE	138 (81.2%)	33(18.8%)	170
Resources & patients etc barrier of precautions	154(90.6%)	16 (9.4%)	170
Medical history before treatment	154(90.6%)	16(9.4%)	170

\* Personal Protective equipment.

**Table 2:** Parameters of hand washing.

Parameter	Frequency	Percentage	Total
Type of Soap			
• Bar	150	82.2%	170 (100%)
• Liquid Soap	12	7.1%	
• Nil	08	4.7%	
Method of drying hands			
• Hot air dryer	04	2.4%	170 (100%)
• Multiple use towel	94	55.3%	
• Single used towel	72	42.2%	
Routine of Hand washing			
• After contact with patients.	58	34.1%	170 (100%)
• After removing gloves	86	50.6%	
• After touching contaminated objects	26	15.3%	
Use of PPE			
• Gloves only	36	21.2%	170 (100%)
• Masks only	02	1.2%	
• Gloves/Masks	126	74.1%	
• Plastic Apron/ face shield/ Protective eyewear	06	3.5%	
Hand Washing	Yes	No	Total
• Soap Application	162(95.3%)	08 (4.7%)	170 (100%)
• Washing >30 second	158(92.9%)	12 (7.1%)	170 (100%)

There was no significant difference in both gender regarding their understanding that Dental hospitals can be source spread of the infections such as hepatitis B, hepatitis C and HIV ( $p=0.230$ ). Knowledge regarding special precautions to be taken for HBV, HCV and HIV patients and regarding instruments of HIV patients to be reprocessed specially was similar as  $p=0.361$  and  $p=1.00$  respectively.

Similarly 46 males doctors and 46 female doctors agreed that HIV patients should be treated in special clinics while 42 male doctors and 36 female doctors disagreed to it ( $p=0.828$ ). Both genders agreed to the fact that autoclave sterilization was better than hot air sterilization ( $p=0.305$ ). Knowledge regarding vaccination of health care workers against different diseases was also uniformly distributed as  $p=0.714$ . Perception regarding zygoma and inner corner of eye are major contaminated area was insignificant in both genders ( $p=0.513$ ). Both male and female gender agreed that there is still need for vaccination against HBV even after using PPEs ( $p=1.00$ ). Similarly gender did not had significant impact on the perception that medical history of each patient should be taken before treatment ( $p=1.00$ ).

Perceptions of dental practitioners were not influenced by their educational level except for their knowledge and no significant variation in perception level was observed.

The study results have indicated that majority (92.9%) of the doctors washed their hands for more than half of minute which is recommended time for hands washing by healthcare professionals. It is further observed majority (95.3%) washed their hands with soap and only 4.7% of doctors washed their hands with tap water only. Our study results have indicated that most of the doctors (82.2%) were using bar soap which was being shared by others as well while only 7.1% of the doctors used liquid soap having disinfectant while 55.3% of the doctors had used the towel (for drying hands) which was being shared by the others as well. Multiple use of towel can also help to spread infections if it has been misused previously so this practice must be corrected.

The study results have indicated that majority of doctor were using gloves and masks, 21.2% used only gloves, 1.2% used masks only and only 3.5% of the doctors used plastic apron/face shield and protective eyewear as well (Table 2).

There was no significant difference between male and female gender regarding use of soap in washing their hands ( $p=1.00$ ), type of soap ( $p=0.639$ ), hand washing for more than 30 seconds ( $p=0.423$ ). Use of multiple used of single towel in male gender and use of single used towel in female gender was highly significantly observed ( $p=0.000$ ). Routine of hand washing was similar in both genders ( $p=0.570$ ) while female doctors used PPEs significantly more than male gender ( $p=0.004$ ).

When the level of education was stratified with respect to the observation of hand washing, it was observed there was no significant difference of practices with respect to qualification except for the use of single used towel, in which surprisingly doctors with higher qualification used significantly more multiple used towel than those of having BDS qualification ( $p=0.01$ ).

Table 3 describes the observations regarding sterilization and decontamination practices and the study results have indicated that poor practices were observed in this regard. Only 51.8% used rubber Dam and high volume suction to save from splatters, only 47.1% cleaned, disinfected clinical contact surface for every patient. Hand-pieces sterilization/cleaning/lubrication/disinfected was done by 67.1% of dental practitioners. Change of surface barriers was practiced by only 40% of the dental health care professional while 60% did not show any compliance with it.

Table also depicts different measures taken by doctors for their personal protection. The study results have indicated that poor compliance was observed regarding personal protection measures and infection control. Only 21.2% of the doctors changed masks between patients, 10.6% used protective clothing while doing their procedures and 35.3% doctors did not cover mouth and nose with masks while treating their patients. All the doctors included in this study used disposable needles. Non-punctured resistant material containers were not available to any doctor and hence their use was 0% as none of the doctors used them. Again poor compliance with bending of needle (only 23.5%) was observed and majority of the doctors (76.5%) did not comply with this.

As these results were stratified with respect to gender it was observed that gender did not had any impact on change of mask ( $p=0.290$ ), mask covering mouth and nose ( $p=0.068$ ), wearing protective clothing ( $p=0.486$ ), removal of clothing before leaving office

Table 3: Practices regarding Personal Protection.

Personal Protection	Yes	No	Total
Mask change between patients	36 (21.2%)	134(78.8%)	170(100%)
Mask covering mouth and nose	110(64.7%)	60(35.3%)	170(100%)
Use of protective clothing	18(10.6%)	152(89.4%)	170(100%)
Gloves changed when moist/soiled	160(94.1%)	10(5.9%)	170(100%)
Gloves discarded after single use	166(97.6%)	04(2.4%)	170(100%)
Use of fresh instrument for every patient	164(96.5%)	06(3.5%)	170(100%)
Use of Rubber Dam/High volume suction	88(51.8%)	82(48.2%)	170(100%)
Change of suction tip	138(81.2%)	32(18.8%)	170(100%)
Spittoon washed regularly	124(72.9%)	46(27.1%)	170(100%)
Disinfection of clinical contact surfaces	80(47.1%)	90(52.9%)	170(100%)
Change of Surface barriers	68(40%)	102(60%)	170(100%)
Sterilization of hand pieces	114(67.1%)	56(32.9%)	170(100%)
Disposal of single use only items	148(87.1%)	22(12.9%)	170(100%)
Use of disposable needles	170(100%)	Nil	170(100%)
Use of non-punctured resistant material containers	Nil	170(100%)	170(100%)
Bending of needle before disposal	40 (23.5%)	130(76.5%)	170(100%)

**Table 4:** Practices regarding use of Jewelry.

Use of Jewelry	Frequency	Percentage
Yes	66	38.80%
No	104	61.20%
Total	170	100%

( $p=1.00$ ), change of gloves when moist/soiled ( $p=1.00$ ), discarding the gloves after single use ( $p=1.00$ ) and use of fresh instruments for each patients ( $p=0.607$ ). So the study results have indicated that there is no significant difference between practices of male and female doctors regarding their personal protection attitudes.

Similarly the results of personal protection were stratified with regards to the educational level and it was observed that educational level did not had significant relationship regarding personal protection of dental practitioners and higher level of education did not had any significant impact on study results.

Table 4 shows the use of jewelry among study participants and the study results indicated that 38.8% use of jewelry. All of these doctors who used jewelry in their hands were females and our study included 82 female doctors hence overall use of jewelry by female doctors was 80.48% (66/82) while none of male doctors used jewelry in their hands. P value was also calculated and it was observed that impact of gender on use of jewelry was significant ( $p=0.000$ ). The study results indicated that only 27.05% use of sterilized cotton during procedure which points towards poor compliance with infection control measures. When this use of sterilized cotton was stratified with gender then it was observed that male gender used this cotton significantly greater in number than female gender as p value was 0.001.

## DISCUSSION

Dentistry is a such profession which involves continuous risks of exposure to different environmental as well as human infectious diseases which can be transmitted through blood, oral and oropharyngeal secretions, air and water [8,9].

Contamination may harm health care workers, patients and even members of their families [10,11]. Occupational health hazards leading to blood and other organic fluids account for the most frequent exposure resulting in a higher risk of contracting diseases such as HIV, hepatitis B and C, meningococcal disease, mononucleosis, herpes, among others [12,13].

Biosafety is a growing concern of all health care facilities. Confronted with different contaminations and higher biological risks both for patients and dental professionals in dental hospitals and clinics and due to the continuous invention of new techniques, behavioral attributes, available information, advanced equipments and resources in this field, various Health Organizations such as the "Center for Disease Control (CDC), the American Dental Association (ADA), the National Sanitary Department (ANVISA) and the Ministries of Health (MOH)" have adopted certain principles for the prevention and elimination or minimizing threats to the life or health during dental procedures. These guidelines might be implemented by the health care professionals and their team members before, during, and after the procedures and treatments for all patients. These include all instruments and equipment employed, regardless of their confirmed status or presumed diagnosis, are infectious [14,15].

Use of sterile gloves is most effective protective practice for

preventing or minimizing disease transmission in any dental hospital and clinic [16,17]. Many studies conducted previously, have revealed that 56% to 100% of dental professionals used sterile gloves. Moreover, use of disposable facial masks is usually suggested for all the procedures which could lead to aerosols and also to provide a safer environment for those dental practitioners. Many previously conducted studies have reported 32% to 90.1% use of disposable facial masks among dental healthcare providers [18-21].

Eye protection is another key factor regarding the infection control measures and wearing eye protection cover is also an important aspect in this area as it protects the dental operators from those of "aerosols, debris and potentially infective particles". Previous studies have reported 14.7% to 91.2% use of protective eye wear among dental practitioners while doing their procedures.

The available data demonstrates that proper compliance to these infection control measures is generally attributed to the developed countries while standard precautions are not usually implemented and even practiced properly in many countries. Poor compliance or adherence to guidelines with current infection control recommendations have been observed and reported in many different studies [18,19,22]. It was acknowledged that even though South Africa accommodates higher burdens of infectious disease, the knowledge and practices with regards to the infection control measures among dental professionals was poor [8]. However, recent data has shown that there have been some positive trends related to proper compliance for infection control measures among dental hospital staff while doing dental procedures. Scully showed that these dental professionals had fairly higher levels of knowledge related infection control practices. A survey conducted in United States Air Force, dental hospitals has reported excellent compliance with current infection control principles [11]. Fabiani has reported that dental professionals needed training on regular basis as well as continuing education for the prevention of cross-infections [23]. Another recent study has shown that higher compliance with suggested infection control measures were observed among the dental practitioners. Another study shows that acceptability of infection control measures has been increased in orthodontists as compared with those of previous studies, but this compliance still remained lower than ideal. Moreover, it has been reported from UK that orthodontists effectively implemented infection control measures and followed guidelines properly [9]. The present study results have indicated that 82.2% of the dental practitioner washed their hands with bar soap, 7.1% washed their hands with liquid soap and 4.7% washed their hands with tap water only and did not use any type of the soap. A study conducted by Matsuda et al reported only 22% hand washing with soap/detergent and tap water only and 78% remaining dental practitioners used specific disinfectants for the purpose of hand washing [24].

The current study results are close to that of Bokhari et al. Puttaiah et al. reported only 62% use of disposable gloves from Lahore. A study from Jordan by Alnegrish et al. reported 73.3% use of gloves and 69.5% use of masks, so our study results are different from that of Puttaiah et al. [25] and Alnegrish et al. [21].

The results of our study are in accordance with the results reported by other studies at national and international level. Good knowledge regarding infection control measures was seen among our study participants. Lack of resources, higher costs, high patient frequency was reported as major hurdle in provision of these facilities.

## CONCLUSION

Good level of knowledge prevailed among dental professionals in current study. Every doctor reported that PPE are good barriers for themselves and patients. Majority of the dentists knew about proper sterilization and disinfection of the instruments as well as clinical surfaces. Regarding infection control practices, majority of the dentists used PPEs such as gloves and facial masks. However use of protective eyewear and face shield was not common in our study cases. There is a need for more training programs and continuous surveillance audits for the proper utilization of these equipments. To ensure these infection control practices in a proper way, hospital authorities must arrange for proper provision of these PPEs to protect their staff and patients.

## REFERENCES

- Rautemaa R, Nordberg A, Wuolijoki-Saaristo K, Meurman JH. Bacterial aerosols in dental practice—a potential hospital infection problem? *J Hosp Infect.* 2006;64:76-81.
- Spencer RC. Craigavon Area Hospitals Group Trust infection control manual. *J Hosp Infect.* 2006;64:311.
- Ebrahimi M, Ajami BM, Rezaeian A. Longer years of practice and higher education levels promote infection control in Iranian dental practitioners. *Iran Red Crescent Med J.* 2012;14(7):422-429.
- Onana J, Ngongang A. Hygiene and methods of decontamination, disinfection and sterilization in dental offices in Yaounde. *Odontostomatol Trop.* 2002;25:45-51.
- Taiwo J, Aderinokun G. Assessing cross infection prevention measures at the Dental Clinic, University College Hospital, Ibadan. *Afr J Med Med Sci.* 2002;31(3):213-217.
- Al-Rabeah A, Moamed AG. Infection control in the private dental sector in Riyadh. *Ann Saudi Med.* 2002;22(1-2):13-17.
- Elkarim I, Abdulla Z, Yahia N, AlQudah A, Ibrahim Y. Basic infection control procedures in dental practice in Khartoum—Sudan. *Int Dent J.* 2004;54(6):413-417.
- Oosthuysen J, Potgieter E, Blignaut E. Compliance with infection control recommendations in South African dental practices: a review of studies published between 1990 and 2007. *Int Dent J.* 2010;60:181-189.
- Shah R, Collins JM, Hodge TM, Laing ER. A national study of cross infection control: 'are we clean enough?'. *Br Dent J.* 2009;207:267-274.
- Cavalcante NJF, Monteiro ALC, Barbieri DD. *Biossegurança. Atualidades em DST/AIDS.* 2ª ed. São Paulo: Programa Estadual de DST/AIDS da Secretaria do Estado da Saúde de São Paulo; 2003. 80 pp.
- Harte JA, Charlton DG. Characteristics of infection control programs in U.S. Air Force dental clinics: a survey. *J Am Dent Assoc.* 2005;136:885-892.
- Davis D, BeGole EA. Compliance with infection-control procedures among Illinois orthodontists. *Am J Orthod Dentofacial Orthop.* 1998;113(6):647-654.
- Cristina ML, Spagnolo AM, Sartini M, Dallera M, Ottria G, Lombardi R, et al. Evaluation of the risk of infection through exposure to aerosols and spatters in dentistry. *Am J Infect Control.* 2008;36:304-307.
- Garbin AJI, Garbin CAS, Arcieri RM. Biosecurity in public and private office. *J Appl Oral Sci.* 2005; 13(2):163-166.
- Rosa MRD, Albuquerque SSL, Júnior AAV, Coelho AEL. Comportamento dos Cirurgiões-Dentistas em Relação à Utilização do Equipamento de Proteção Individual (EPI) no Controle de Infecções. *Rev. Bras. Ciênc. Saúde.* 2001;5(2):125-130.
- Cleveland JL, Bonito AJ, Corley TJ, Foster M, Barker L, Gordon Brown G, et al. Advancing infection control in dental care settings: factors associated with dentists' implementation of guidelines from the Centers for Disease Control and Prevention. *J Am Dent Assoc.* 2012;143(10):1127-1138.
- November-Rider D, Bray KK, Eklund KJ, Williams KB, Mitchell TV. Massachusetts dental public health program directors practice behaviors and perceptions of infection control. *J Dent Hyg.* 2012;86(3):248-255.
- Kanjirath PP, Coplen AE, Chapman JC, Peters MC, Inglehart MR. Effectiveness of gloves and infection control in dentistry: student and provider perspectives. *J Dent Educ.* 2009;73:571-580.
- Montagna MT, Napoli C, Tatò D, Liguori G, Castiglia P, Tanzi ML, et al. Multicentric survey on hygienic aspects in private dental practice. *Ann Ig.* 2003;15:717-724.
- Scully C, Moles DR, Fiske J. Infection control: a survey of UK special care dentists and dental care professionals. *Prim Dent Care.* 2007;14:40-46.
- AlNegrish A, Al Momani AS, Al Sharafat F. Compliance of Jordanian dentists with infection control strategies. *Int Dent J.* 2008;58:231-236.
- Yüzbaşıoğlu E, Saraç D, Canbaz S, Saraç YS, Cengiz S. A survey of cross-infection control procedures: knowledge and attitudes of Turkish dentists. *J Appl Oral Sci.* 2009;17:565-569.
- Fabiani L, Mosca G, Giuliani AR. Hygiene in dental practices. *Eur J Paediatr Dent.* 2006;7:93-97.
- Matsuda JK, Grinbaum RS, Davidowicz H. The assessment of infect control in dental practices in the municipality of São Paulo. *Braz J Infect.* 2011;15.
- Puttaiah R, Bedi R, Almas K. A survey of infection control practices among general dental practitioners in Lahore Pakistan. *J Pak Dent Assoc.* 2001;10(2):71-76.