

Infection Control Measures in Alexandria Ministry of Health and Health Insurance Organization Dental Clinics

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Abstract:

The present study attempted to explore the adequacy of infection control measures currently employed in the dental clinics of the Ministry of Health (MOH) and Health Insurance Organization (HIO) in Alexandria. It also aimed to assess the level of compliance of dentists with internationally recommended infection control guidelines and to determine barriers that inhibit the implementation of ideal procedures. The study sample comprised 20 of the MOH dental clinics and 27 of the HIO dental clinics in Alexandria. All the chosen clinics were visited by the researchers. A total of 176 MOH dentists (74 males and 102 females) and 83 HIO dentists (36 males and 47 females) participated in the study. A specially designed observational checklist was used to assess the availability of the different internationally recommended infection control measures in the visited dental clinics. Furthermore, a comprehensive infection control questionnaire was designed to obtain information from all dentists available at the

times of the visits regarding the various procedures they use for cross-infection control and to assess their attitudes and perceptions about their own procedures as well as the barriers that may hinder the application of ideal procedures. The results of the study revealed wide disparity between internationally recommended infection control measures and currently employed procedures. It further revealed low levels of compliance of dentists with recommended guidelines. Relatively high percentages of MOH (75.60%) and HIO (43.37%) dentists reported reusing disposable gloves with washing between patients. Only 32.39% of MOH dentists and 60.24% of HIO dentists reported wearing face masks during dental treatment. Protective eye-glasses were not found to be available in any of the surveyed clinics. Only 59.66% of MOH dentists and 61.44% of HIO dentists were found to be vaccinated against hepatitis-B virus.

Although each clinic was found to possess a heat sterilizer (dry heat oven), yet a wide range of instruments was reported to be disinfected rather than being sterilized specially during the working day. The results also revealed infrequent disinfection of dental unit and other

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environmental surfaces. Among the stated barriers to the implementation of ideal procedures were, insufficient supply of the different personal protection measures, inavailability of sterilizable handpieces and the relatively large number of patients seen daily which entailed the frequent use of the limited sets of instruments available thus, interfering with attempts for proper sterilization. It was concluded that, though some positive areas could be detected in the existing infection control programs particularly concerning the percentages of dentists wearing gloves during dental treatment, the presence of a heat sterilizer in each clinic and the use of disposable needles, yet much remains to be improved. Recommendations to improve the effectiveness of the existing infection control programs were given. These included directing more resources to the purchase of the various instruments and equipment necessary for cross-infection control, instituting periodic inservice training courses for dentists and their auxiliary staff to train them in the different scientifically accepted infection control practices and encouraging the vaccination of all dental health workers against hepatitis-B virus.

Intruduction:

Concerns about the spread of the human immunodeficiency virus (HIV) has focused a lot of attention during the last decade on the development, implementation and routine use of effective infection control strategies in the different health care delivery settings⁽¹⁻⁵⁾. Dental personnel, as well as other health

professionals are morally and legally responsible for delivering health care to their patients in an environment free of infectious hazards⁽⁶⁾. Yet, the willingness of health care providers to respond to well documented guidelines and recommendations for infection control is primarily influenced by their background knowledge of infectious diseases and their understanding of the principles associated with occupational infection risks^(7,8).

Cross-infection is the transmission of infectious agents among patients and staff within a clinical environment⁽⁹⁾. Dental health care workers and their patients may be exposed to a variety of micro-organisms via blood, oral or respiratory secretions. These micro-organisms include cytomegalovirus, hepatitis-B virus (HBV), hepatitis C virus (HCV), herpes simplex virus types 1 and 2, human immunodeficiency virus (HIV), Mycobacterium tuberculosis, staphylococci, streptococci and other viruses and bacteria specifically those that infect the upper respiratory tract⁽¹⁰⁾. Infections may be transmitted in the dental clinic through several routes including, direct contact with blood, oral fluids or other secretions; indirect contact with contaminated instruments, equipment or environmental surfaces; or contact with air-borne contaminants present in either spatter or aerosols of oral and respiratory fluids⁽¹⁰⁾. However, for an infection to occur there must be a unique combination of events, commonly referred to as "the chain of infection". Such chain involves a susceptible host; a pathogen with sufficient infectivity and numbers to cause infection; and a portal of entry through which pathogens may enter the host. Effective infection control strategies are intended to break one or more of these links in the chain, thereby preventing infection^(9,10)

Dentistry, in many respects, has led the way in addressing the clinical infection control challenges in health care delivery⁽⁷⁾. Many dental health authorities and related associations around the world have issued infection control guidelines and recommendations that would reduce the risk of transmission of infectious diseases in dental practice if closely adhered to^(6,7,10-16). A comprehensive infection control program should encompass a number of aspects including; patient screening and evaluation, personal protection, instrument sterilization, surface and equipment disinfection, disposal of waste, aseptic technique and laboratory asepsis^(6,15). The goals and objectives of such a program should be to reduce the concentration of pathogenic microorganisms to allow normal host defense mechanisms to prevent infection; to break the cycle of infection and eliminate cross-contamination; and to treat every patient and instrument as potentially infectious by routinely employing universal precautions in the management of all patients⁽⁸⁾.

Surveys of cross infection control procedures in dental practice have been conducted in various countries⁽¹⁷⁻²³⁾. The results of these surveys generally revealed a disparity between established guidelines and actual practices.

In Britain, studies have shown that many of the dental practitioners surveyed complied with recommended procedures, but a persistent minority continued to re-use local anaesthetic needles and other items designed for single use and to use boiling or cold chemical disinfectants instead of recognized sterilization procedures⁽²⁴⁻²⁷⁾.

A study⁽²⁸⁾ was conducted in the North Western Health Region of England in an attempt to establish how dentists' knowledge, opinion and behavior about cross-infection were related and how they were affected by their ages, gender and the size of the practices in which they worked. The results of the study revealed that younger dentists were more knowledgeable about cross-infection control measures than older ones and were more likely to wear gloves. Irrespective of age, all female dentists were more likely to wear gloves than their male colleagues.

Another survey⁽²⁹⁾ was carried out to investigate the methods of handpiece asepsis employed by general dental practitioners in England and the problems considered to be associated with handpiece sterilization. The results indicated that autoclavable handpieces were possessed by 90.6% of the respondents with 45.9% of these respondents indicating that they autoclaved their handpieces routinely after each patient. Mass-media coverage was found to have exerted influence on the respondent dentists behavior, with the overall incidence of routine handpiece autoclaving increasing by 20.6% after media coverage of the subject.

The influence of publicity on dental practitioners' behavior was shown by another follow-up study⁽³⁰⁾ conducted in Scotland. The results of the study revealed an increase in glove wear by dentists from 9% in 1983 to 46% in 1988. The authors attributed such increase in glove wear to a substantial amount of publicity about the high prevalence of HIV and HBV positive patients in the region.

A national survey⁽³¹⁾ was conducted in New-Zealand to investigate the cross infection

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control procedures employed in dental practices and to gauge dentists' perceptions of their current procedures. The majority of responses complied with guidelines but specific difficulties were identified with regard to sterilization of handpieces.

It is of major importance to have reliable information about cross-infection control procedures followed currently in dental practices, in order to determine whether dentists and their staff are able to comply with recommended guidelines, and to understand dentists' perceptions of their own procedures. Such information would be of value in determining the need for specific services and in developing appropriately targeted infection-control educational material.

Thus, the aim of the present study was: to assess the adequacy of infection control measures currently employed in the dental clinics of the Ministry of Health and Health Insurance Organization in Alexandria; to assess the compliance level of dentists with internationally recommended infection control measures; and to determine barriers that inhibit the implementation of ideal procedures.

Materials and Methods:

The present study involved the dental clinics of two major governmental organizations for the delivery of dental health services in Alexandria, namely, the Ministry of Health (MOH), and Health Insurance Organization (HIO). Formal contact was first made with the concerned authorities in the two organizations to acquaint

them with the purpose of the study and ask for their approval and assistance. Lists of all dental clinics belonging to the MOH and HIO in Alexandria City were secured.

The study sample comprised 20 of the MOH dental clinics [approximately 50% random sample) and 27 of the HIO dental clinics [25% random sample of dental clinics for school students (N=19) and 50% random sample of dental clinics for adult subscribers (N=8)]. All the chosen clinics were visited by the researchers. A especially designed observational checklist was used to assess the availability of the different internationally recommended infection control measures in the visited dental clinics (Appendix 1). In addition, a comprehensive infection control questionnaire was used to obtain information from all dentists available at the times of the visits regarding the various procedures they use for the prevention of cross-infection and to assess their attitudes and perceptions about their procedures, as well as the barriers which may impede the implementation of ideal procedures.

The questionnaire was first tested on a small group of dentists (N=15) to ensure broad acceptability and was modified to improve clarity. The final questionnaire comprised 5 sections. The first section involved demographic information concerning the age, sex, specialty, place of work and the average number of patients seen daily by the interviewed dentists. This section also included a question regarding the sources from which the dentists have received their infection control information. The second section included 15 questions dealing with the different personal protection measures employed by dentists in the MOH and HIO

dental clinics (Table 1). The third section was concerned with the various methods used for sterilization and disinfection of the different items of dental instruments and equipment (Table 2). This section included questions regarding instruments cleaning prior to sterilization and whether the dental assistant/dentist wore gloves during the cleaning procedures. It also included questions regarding types of chemical disinfectants used and duration of their use, the use of rubber dam isolation during routine operative procedures, recapping the anaesthetic needle, method of disposal of sharps and number of needle punctures received in the last 6 months. The fourth section involved questions regarding the frequency of disinfection of the different surfaces and equipment inside the dental clinic (Table 3). The final section of the questionnaire was concerned with patient evaluation as a potential source of infection. Dentists were asked about taking a complete medical history and keeping a medical record for each patient. They were also asked about requesting medical clearance for medically compromised patients prior to dental intervention. Dentists were also asked whether the possible presence of HIV and HBV positive patients caused their concern. Finally, the dentists were inquired if the presence of an infection control program in dental departments should be mandatory and whether they were satisfied with the already existing program. They were also requested to state the barriers that inhibited the implementation of ideal infection control procedures.

A total of 176 MOH dentists (74 males and 102 females) and 83 HIO dentists (36 males and 47 females) completed the interview

questionnaire. Their age ranged from 26 to 57 years (mean=37.9, SD=6.89).

Approximately 68% of MOH dentists and 65% of HIO dentists were general practitioners, whereas 32% and 35%, respectively were specialists. The average number of patients reported to be seen daily by MOH dentists was 19 and by HIO dentists was 28.

Statistical Analysis:

The availability of the different internationally recommended infection control measures was checked for each clinic and numbers and percentages of clinics with these measures available were noted. Also, percentages of dentists with positive responses to the different personal protection questions were computed. "Z" tests comparing percentages of male and female dentists of both MOH and HIO were then calculated. Also, total percentages (males+females) of MOH and HIO dentists were compared using "Z" test. Percentages of dentists reporting the use of different methods of sterilization and disinfection for different items of equipment were calculated. Similarly, the percentages of dentists reporting different patterns of equipment and surface disinfection were calculated.

Results:

Analysis of observations of the availability of the different internationally recommended infection control measures in the surveyed

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MOH and HIO dental clinics revealed that among the different personal protection items, disposable gloves and face masks were found to be available in all clinics. Protective clinic coats were observed in 17 (85%) of the MOH and all of the HIO clinics (100%). However, antiseptic handwashes, disposable towels and protective eye glasses or face shields were not found in any of the surveyed clinics.

As for the methods of sterilization and disinfection employed, each clinic was found to possess a dry heat oven. Glass beads sterilizers were found in 6 (22.22%) of the HIO clinics. Water boilers were found in 16 (80%) of the MOH and 23 (85.19%) of the HIO clinics. On the other hand, none of the surveyed clinics were found to have autoclaves or ultrasonic cleaners. Furthermore, none of the clinics were found to employ special sterilization monitoring or instrument packaging techniques.

Techniques which can reduce the spread of microorganisms including rubber dam isolation and routine patient use of antiseptic mouth wash prior to treatment were not applied in any of the surveyed clinics. Furthermore, a high suction evacuation system was only found in 2 (10%) of the MOH and 6(22.22%) of the HIO clinics.

Disposable needles were found to be available in all the surveyed clinics, however, only one (5%) of the MOH and one (3.70%) of the HIO clinics were found to dispose of sharps in safety containers.

Surface disinfectants available in both MOH and HIO clinics were found to be sodium hypochlorite (house bleach), povidone - iodine (Betadine), chlorhexidine + cetrimide (Savlon),

chloroxylonol (Dettol), hydrogen peroxide and alcohol. In addition, glutaraldehyde (Cidex) was available in all HIO clinics. Disposable covers were not available in any of the surveyed clinics.

No filing system was found to exist for MOH patients other than those attending the dental clinics of the maternal and child health centers (MCH). On the other hand, each of the HIO patients was found to possess his own personal treatment record showing all his current and previous illnesses and medications.

In response to the question regarding their sources of infection control information, various sources were identified by the studied dentists. Both MOH and HIO dentists reported having received inservice training courses to update their knowledge concerning the different infection control strategies which should be employed in dental practice to minimize cross-infection. Other sources of information which were reported by the interviewed dentists included conferences, professional journals, mass media, personal professional experience and information from colleagues and dental equipment suppliers.

Table (1) demonstrates the positive responses of the interviewed MOH and HIO dentists to the different personal protection questions. Among MOH dentists, 71.02% reported washing their ungloved hands before dental treatment and 77.27% after dental treatment. The corresponding percentages for HIO dentists were 79.52% and 85.54%, respectively. Only 7.95% of MOH dentists and 12.05% of HIO dentists reported washing their hands with an antiseptic handwash and none of them reported using disposable towels to dry

their hands. During dental examination lower percentages of dentists reported wearing gloves (71.59% of MOH dentists and 79.52% of HIO dentists) compared to those reporting wearing gloves during dental treatment (86.36% and 93.98% of MOH and HIO dentists, respectively). Only 24.40% of MOH dentists reported changing gloves after each patient compared to a significantly higher percentage of 56.63% of HIO dentists ($Z=5.04$, $P < 0.05$). On the other hand, considerably high percentages of dentists reported wearing gloves when using the phone or equipment away from patient (82.89% of MOH dentists and 75.64% of HIO dentists) and while writing or looking at records or X-rays (96.05% of MOH and 84.62% of HIO dentists). None of the interviewed MOH and HIO dentists reported wearing protective eyeglasses (other than their own), or protective face shields during dental treatment. Only 32.39% of MOH dentists wore face masks during dental treatment compared to a significantly higher percentage of 60.24% of HIO dentists ($Z=4.25$, $P < 0.05$). All HIO dentists (100%) reported wearing clinic coats compared to a significantly less percentage of 83.52% of MOH dentists.

Although the possible presence of HIV and HBV positive patients was found to concern all of the interviewed dentists, yet only 59.66% of MOH dentists and 61.44% HIO dentists were found to be vaccinated against hepatitis B virus. Reasons for non-vaccination included concerns about safety and fear of side-effects.

Expect for questions number 8, 13 and 14 of table (1) responses of the interviewed MOH and HIO dentists did not differ significantly from each other. Also, responses of male and female dentists of either MOH or HIO did not differ

significantly from each other except that significantly more of MOH female dentists (91.01%) than male dentists (71.43%) wore gloves when using phone or equipment away from patient ($Z=3.41$, $P < 0.05$).

All of the interviewed MOH and HIO dentists reported that dental instruments were being cleaned manually by dental assistants using soap and water prior to sterilization. However only 31.82% of MOH dentists and 54.22% of HIO dentists reported that their assistants wore gloves while cleaning instruments.

Table (2) demonstrates the various methods of sterilization and disinfection reported to be used in the MOH and HIO dental clinics. Sterilization of metal instruments was reported to be mainly accomplished by dry heat oven. However, boiling water (48.86% of MOH dentists, 32.53% of HIO dentists), and cold chemical solutions (69.89% and 100.00% of MOH and HIO dentists, respectively) were also reported to be used for instrument disinfection during the working day, specially for the more frequently used instruments (such as extraction forceps, mirrors and explorers). Impression trays were reported to be disinfected either by immersion in cold chemical solutions (68.18% of MOH dentists and 78.31% of HIO dentists) or by wiping with a disinfectant (31.82% of MOH dentists and 21.69% of HIO dentists). Various methods were reported to be used for sterilization and disinfection of matrix holders including dry heat oven (26.14% of MOH dentists and 33.73% of HIO dentists), boiling water (19.89% of MOH dentists and 18.07% of HIO dentists), cold chemical solutions (83.52% of MOH dentists and 77.12% of HIO dentists) and wiping with disinfectant (31.82% of MOH

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dentists and 30.12% of HIO dentists).

Only 8.43% of HIO dentists reported sterilizing handpieces with glass beads sterilizer after each patient, whereas 91.57% of the HIO dentists and all of the MOH dentists reported wiping handpieces with a disinfectant after each patient. Burs were reported to be sterilized by dry heat oven by 13.07% of MOH dentists and 20.48% of HIO dentists and by glass beads sterilizers by 13.25% of HIO dentists. They were also reported to be disinfected by immersion in cold chemical solutions by 72.73% of MOH dentists and 50.60% of HIO dentists, and by wiping with a disinfectant by 30.68% of MOH dentists and 32.53% of HIO dentists. Disposable saliva ejectors and needles were reported to be used by all MOH and HIO dentists, who also reported recapping the needles after use. However, the disposal of needles as well as other sharps in a rigid container separate from other wastes was a procedure followed by only very small percentages of MOH dentists (7.95%) and HIO dentists (8.43%). All MOH and HIO dentists reported wiping amalgam carriers with a disinfectant, sterilizing instrument trays in dry heat oven and autoclaving cotton and gauze before use by sending to a central autoclave.

Sodium hypochlorite, betadine, alcohols and hydrogen peroxide were reported to be the most commonly used chemical disinfecting solutions in both MOH and HIO dental clinics. Glutaraldehyde was also reported to be used by all HIO dentists. All solutions were reported to be used for less than 30 minutes for disinfection of instruments during the working day. Moreover, instruments were reported by HIO

dentists to be immersed in glutaraldehyde over the night (more than 10 hours) before being sterilized the following day with dry heat oven.

None of the MOH or HIO dentists reported disinfecting impressions, dentures or orthodontic appliances either before sending or upon receipt from the dental laboratory. Similarly, none of the dentists reported using rubber dam isolation during routine operative procedures.

Table (3) demonstrates the frequency of surface and equipment disinfection (by dental assistants), as reported by the interviewed MOH and HIO dentists. Routine disinfection of surfaces and equipment after each patient was reported by only few of the MOH and HIO dentists, with percentages ranging from none (.00%) for disinfection of cabinets to 27.27% of MOH dentists and 30.21% of HIO dentists for disinfection of water/air syringe. Certain items of equipment were reported to be disinfected only once or twice weekly by relatively high percentages of dentists, for example, cabinets (98.30% of MOH dentists and 87.95% of HIO dentists), handpiece connections (77.84% of MOH dentists and 64.47% of HIO dentists) and patient head-rest (67.05% of MOH and 51.81% of HIO dentists).

In an attempt to quantify the risk of transmission of infection from patients to dentists, the interviewed dentists were asked to indicate the number of times in the past 6 months they had sustained a penetrating wound from a needle, drill or other sharp instrument. The average number of wounds was 3 for MOH dentists and 4 for HIO dentists.

Table (1): Positive responses to the different personal protection questions among the studied MOH and HIO dentists.

Personal Protection Questions	HIO Dentists				Z1		Z1		Z3	
	Males (N=74)		Females (N=102)		Total (N=176)		MOH Males vs Females		HIO Males vs Females	
	%	%	%	%	%	%	%	%	%	%
1 - Do you wash your ungloved hands before dental treatment?	70.27	71.57	71.02	83.33	76.60	79.52	0.19	0.70	1.51	1.51
2 - Do you wash your ungloved hands after dental treatment?	77.03	77.45	77.27	88.89	82.98	85.54	0.07	0.76	1.63	1.63
3 - Do you wash your hands with antiseptic hand wash?	40.05	10.78	7.95	13.89	10.64	12.05	1.62	0.45	1.05	1.05
4 - Do you give your patient antiseptic mouth wash prior to treatment?	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
5 - Do you use disposable towels to dry your hands?	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
6 - Do you wear disposable gloves during dental examination?	68.92	73.53	71.59	77.78	80.85	79.52	0.67	0.33	1.22	1.22
7 - Do you wear disposable gloves during dental treatment?	85.14	87.25	86.36	94.44	93.62	93.98	0.40	0.19	1.82	1.82
8 - If you wear gloves during treatment, do you change them: (a) After each patient (b) When damaged or spoiled	30.16	20.22	24.40	61.11	53.19	56.63	1.29	0.72	5.04*	5.04*
9 - If you wear gloves for more than one patient, do you wash them after each patient?	69.84	79.78	75.60	38.89	46.81	43.37	1.40	0.72	5.04*	5.04*
10 - Do you wear gloves when using phone or equipment away from patient?	100.00	100.00	100.00	100.00	100.00	100.00	-	-	-	-
11 - Do you wear gloves while writing or looking at records or X-ray?	71.43	91.01	82.78	67.64	81.82	75.64	3.41*	1.27	0.09	0.09
12 - Do you wear protective eye glasses/face shield during dental treatment?	93.65	97.75	96.05	79.41	88.63	84.62	0.97	0.77	0.27	0.27
13 - Do you wear a face mask during dental treatment?	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
14 - Do you wear a clinic coat?	28.38	35.29	32.39	58.33	61.70	60.24	0.98	0.32	4.25*	4.25*
15 - Are you vaccinated against hepatitis-B virus?	81.08	85.29	83.52	100.00	100.00	100.00	0.49	-	3.93*	3.93*
	56.76	61.76	59.66	58.33	63.83	61.44	1.34	0.24	0.27	0.27

* Denotes significance at 5% level.

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Table (2): Sterilization and disinfection methods reported to be used by MOH and HIO dentists (%)

Items of Equipment	Methods of Sterilization and Disinfection													
	Autoclave		Dry Heat Oven		Glass Beeds		Boiling water		Cold chemical Solutions		Wipe with disinfectant		Throw away	
	MOH Dentists	HIO Dentists	MOH Dentists	HIO Dentists	MOH Dentists	HIO Dentists	MOH Dentists	HIO Dentists	MOH Dentists	HIO Dentists	MOH Dentists	HIO Dentists	MOH Dentists	HIO Dentists
Instruments	0.00	0.00	100.00	100.00	0.00	0.00	48.86	32.53	69.89	100.00	0.00	0.00	0.00	0.00
Impression trays	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.18	78.31	31.82	21.69	0.00	0.00
Matrix holders	0.00	0.00	33.73	0.00	0.00	0.00	19.89	18.07	83.52	77.12	31.82	30.12	0.00	0.00
Handpieces	0.00	0.00	0.00	0.00	0.00	8.43	0.00	0.00	0.00	0.00	100.00	91.57	0.00	0.00
Burs	0.00	0.00	20.48	0.00	0.00	13.25	0.00	0.00	72.73	50.60	30.68	32.53	0.00	0.00
Saliva ejectors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
Needles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
Amalgam carriers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00	0.00	0.00
Instrument trays	0.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	15.34	0.00	0.00	0.00
Cotton and gauze (before use)	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table (3): Frequency of equipment and surface disinfection as reported by MOH and HIO dentists.

Equipment and Surface disinfection	MOH Dentists (N=176)						HIO Dentists (N=83)					
	After each patient		1-2 times daily		1-2 times weekly		After each patient		1-2 times daily		1-2 times weekly	
	N	%	N	%	N	%	N	%	N	%	N	%
1- Water/air syringe	48	27.27	85	48.30	43	24.43	25	30.12	41	49.40	17	20.48
2- Light handle	7	3.98	71	40.34	98	55.68	7	8.43	48	57.83	28	33.73
3- Dental chair	3	1.70	80	45.45	93	52.84	6	7.23	41	49.40	36	43.37
4- Patient head rest	0	0.00	61	34.66	118	67.05	3	3.61	37	44.58	43	51.81
5- Handpiece connections	0	0.00	39	22.16	137	77.84	2	2.41	25	30.12	56	64.47
6- Spittoon bowl	38	21.59	94	53.41	44	25.00	14	16.87	52	62.65	17	20.48
7- Cabinets	0	0.00	3	1.70	173	98.30	0	0.00	10	12.05	73	87.95

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As regards patient evaluation as a potential source of infection, 64.77% of MOH dentists reported taking a medical history for each patient. Such history was reported to be obtained by direct discussions with patients and to be restricted to current illnesses and medications, with no recording of the obtained information. On the other hand, each patient entitled to services of the HIO has his own personal treatment record showing his illnesses and received treatment. All HIO dentists reported checking each patient's treatment record as well as discussing with him his current and previous illnesses and the medications he is receiving before attempting to undertake any dental treatment. Almost all of MOH dentists (96.59%) and HIO dentists (95.18%) reported requesting medical clearance for medically compromised patients before dental treatment.

Generally, all the interviewed dentists were of the opinion that an infection control program in dental departments should be mandatory. Meanwhile, only 56.25% of MOH dentists and 69.88% of HIO dentists reported being satisfied with the already existing infection control program. The main reasons for not complying with internationally recommended infection control measures were stated by the interviewed dentists to be insufficient supply of the different personal protection infection control measures including gloves, face masks, protective eye glasses,... etc, as well as inavailability of sterilizable handpieces and the relatively large number of patients seen daily which entailed the frequent use of the limited sets of instruments available, thus interfering with attempts for proper sterilization. Reasons given by dentists for not wearing gloves and

masks (other than insufficient supply) included dermatitis, allergy, asthma and inconvenience. Remarks were also made regarding the high costs of the different infection control measures, the deterioration and breakage of a variety of instruments and blunting and rusting of burs with repeated sterilization.

Discussion:

The present study attempted to explore the various aspects related to cross-infection control in the dental clinics of the MOH and HIO in Alexandria so as to identify areas of strength and weakness within the existing infection control programs. It also aimed to assess the level of compliance of dentists with the internationally recommended infection control measures and to understand dentists perceptions of their own procedures, and hence to determine their need for formal education in cross-infection control procedures.

The results of the present study revealed wide discrepancies between recommended guidelines and actual practices. Although all of the interviewed dentists reported receiving information on cross-infection control from a variety of sources including inservice training courses, yet relatively high percentages of MOH and HIO dentists reported not washing their hands either before glove placement (28.98% and 20.48%, respectively) or after glove removal (22.73% and 14.46%, respectively). It has been recommended that hands should be thoroughly washed with a disinfectant liquid soap prior to wearing gloves and after treating each patient^(6,10) to reduce the transient, accumulated macroscopic and microbiological bioburden⁽⁷⁾. Failure of health care workers to properly wash their hands has been shown to result in life-threatening nosocomial infections

among hospitalized patients⁽³²⁾.

The majority of MOH dentists (86.36%) and HIO dentists (93.98%) reported wearing gloves during dental treatment. However, about three fourth of the MOH dentists (75.60%) and 43.37% of the HIO dentists reported re-using the gloves with washing between patients. This was mainly attributed to insufficient supply. It has been advised that surgical or examination gloves should not be washed before use nor should they be washed, disinfected or sterilized for reuse. Washing of gloves may cause penetration of liquids through undetected holes in the gloves. Deterioration of gloves may also be caused by disinfecting agents, oils, certain oil-based lotions and heat treatments^(33,34). Furthermore, the majority of the interviewed dentists reported wearing the gloves while performing other activities away from patient, for example, using the phone, writing, looking at records... etc. These gloves might be contaminated with patient's blood, saliva or respiratory secretions, thus acting as a source of cross-infection. It is important that dental practitioners remove and discard used gloves before attempting to touch objects or equipment away from patients⁽¹⁰⁾.

In spite of being available, only one third (32.39%) of the MOH and 60.24% of the HIO dentists reported wearing face masks which was mainly stated to be due to feeling of inconvenience while wearing a face mask. However, it is important that a well-fitting face mask be worn, especially during high speed instrumentation, as splashing or spattering of blood or other body fluids may lead to spread of infection from patient to dentist⁽¹³⁾. Similarly, the risk of damage to the eye from aerosols, particles of amalgam, calculus and tooth fragments is considerable. Thus, dentists should protect their eyes by means of protective

eye-glasses or face shields especially during operative procedures^(15,27). The results of the present study demonstrated the inavailability of protective eye-glasses or face shields in any of the visited clinics. On the other hand, protective clinic coats were reported to be worn by the majority (83.52%) of MOH and all HIO dentists; to protect personal clothing from being soiled with blood or other body fluids.

Only 59.66% of MOH dentists and 61.44% of HIO dentists were found to be vaccinated against hepatitis B virus. Such percentages are relatively lower than those reported for other countries (94% for England, 77.3% for New Zealand)⁽¹⁶⁾. Vaccination against hepatitis B virus is recommended for all health care providers especially those involved in procedures entailing direct contact with blood or blood-stained body fluids such as dentists and dental assistants. The main objective of immunization is to ensure that both health personnel and patients who are at risk of acquiring hepatitis B are protected^(6,15,35).

Techniques which can reduce the spread of microorganisms including rubber dam isolation, routine patient use of antiseptic mouthwash prior to dental treatment and routine use of efficient high speed evacuation systems were not found to be applied in the surveyed clinics. However, the use of rubber dam isolation during operative procedures has the advantage of minimizing saliva/blood contaminated aerosol production^(13,36). Furthermore, the good visual field and the retraction of tissues which result from rubber dam usage helps reduce injury and subsequent bleeding^(6,15). An antiseptic mouthwash prior to treatment is also useful in reducing the bacterial load and hence the number of air borne bacteria. Similarly, routine use of high-speed aspirators could minimize cross-infection from aerosols⁽⁶⁾.

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Although instruments were reported to be cleaned by dental assistants prior to sterilization, only about one third (31.82%) of the MOH and about half (54.22%) of the HIO dentists stated that their assistants wore gloves during instrument cleaning. Such relatively low percentages are similar to those reported by other authors^(24,27). However, it should be stressed that heavy duty gloves be worn during instrument cleaning to protect against the danger of injuries from sharp, dirty instruments. Also, the use of ultrasonic cleaners is highly recommended, since they were proved to be more efficient than hand scrubbing. They also have the advantages of reducing aerosolization of potentially pathogenic organisms during instrument cleaning and greatly reducing the potential for puncture wounds with contaminated instruments⁽¹⁵⁾.

Instrument sterilization was reported to be mainly accomplished by dry heat oven. However, a wide range of instruments (such as, extraction forceps, mirrors, explorers, matrix holders, impression trays, amalgam carriers and burs) were reported to be disinfected (by boiling, soaking or wiping) rather than sterilized, especially during the working day, which was attributed to the frequent use of the limited number of sets available. All of the MOH and the majority (91.57%) of the HIO dentists reported the only means of disinfecting handpieces to be by wiping with a disinfectant after each patient. This was attributed to inavailability of sterilizable handpieces and fear of spoilage of handpiece by repeated boiling or soaking. However, since dental handpieces may contact soft tissue, saliva, and blood as well as tooth substance, causing both external and internal contamination⁽³⁷⁾, their sterilization has been recommended as an essential part of dental surgery cross-infection control routines^(11,38).

Disposable needles were reported to be used by all of the interviewed dentists who also reported recapping the needles after use, which increased their risk for needle puncture. Thus, it is advised that manual resheathing of needles should be avoided and a needle safety-device may be used for this purpose. Furthermore, as injuries with sharps are the commonest mode by which infection is transmitted in dentistry, disposal of sharps should be done in a separate container which must be rigid, puncture proof and leak resistant⁽⁶⁾.

None of the interviewed dentists reported disinfecting impressions, dentures or orthodontic appliances either before sending or upon receipt from the dental laboratory. However, infection control guidelines indicate that these items should be cleaned from blood and saliva under running tap water and then disinfected before being manipulated in the laboratory. Similarly, they should be disinfected upon receipt from the laboratory and before placement in the patient's mouth⁽¹¹⁾.

Instrument packaging has the advantages of protecting instruments from contamination after sterilization, reducing puncture wounds during handling of instruments and indicating to the operator and the patient that the sterilization process has been completed. Instrument packaging was not found in any of the surveyed clinics and the instruments were simply left in the instrument trays in which they had been sterilized and covered with clean towels, which may expose them to the risk of getting re-contaminated. Similarly, none of the clinics were found to employ specific tests to monitor the efficacy of the sterilization procedures. Such efficacy tests comprise both process or chemical indicators (paper strips or instrument bags impregnated with chemicals which change colour upon exposure to the sterilization cycle)

and biological monitors (ampules or strips of bacterial spores which require high temperatures for extended periods before they lose their viability). Process indicators assure that instruments have been exposed to a sterilizer cycle, but they do not verify that complete sterility has been achieved, whereas biological indicators provide the only real method of verifying the effectiveness of the sterilization procedures^(5,6,39,40). It has thus, been recommended that process indicators should be mandatory for each sterilization cycle whilst a biological indicator should be used at least once a week^(6,38).

It has also been recommended that dental unit and environmental surfaces likely to get contaminated with patient material should be routinely cleaned and disinfected after each patient and at the end of the daily work activities⁽¹⁰⁾. A variety of chemical disinfectants are commercially available. Glutaraldehydes are high level disinfectants capable of destroying all vegetative bacteria, fungi and viruses. They are also able to destroy microbial spores in 6 to 10 hours thus, offering an alternative as immersion sterilants, for those items that cannot withstand heat sterilization and cannot be disposed of (such as non-sterilizable handpieces). Phenolics, iodophors and chlorine-containing compounds are intermediate-level disinfectants useful for disinfecting surfaces that have been soiled with patient material. Low-level disinfectants (such as quaternary ammonium compounds) are appropriate for general cleaning purposes such as cleaning cabinets, floors and walls^(6,10,15,17). The results of the present study revealed infrequent disinfection of dental unit and other environmental surfaces which was attributed to lack of time because of the relatively large number of patients seen daily. Disposable covers can be used to avoid

excessive cleaning of such surfaces⁽¹³⁾. It is also useful to develop a system of zoning which reduces the number of areas contaminated⁽⁴¹⁾.

No filing system was found to exist for MOH patients other than those attending the dental clinics of the MCH centers. Furthermore only 64.77% of the interviewed MOH dentists reported taking a medical history from each patient. As for HIO patients, each patient had his personal treatment record which all the interviewed dentists reported to check before dental intervention. Infection control guidelines indicate that a thorough medical history should be taken from each patient and updated at each visit. Such history should be recorded in a special sheet and kept in a patient's file. In history taking the dentist should identify the infectious diseases of concern as well as other problems that could adversely affect the proposed dental treatment^(6,42). However, as a significant proportion of patients with infectious diseases cannot be identified by means of a medical history, universal infection control procedures should be implemented for all patients.

Conclusion:

The results of the present study revealed wide disparity between internationally recommended infection control measures and currently employed procedures. It further revealed low levels of compliance of respondent dentists with recommended guidelines. Though some positive areas could be detected in the existing infection control programs particularly concerning the percentages of dentists wearing gloves during dental treatment, the use of disposable needles and the presence of a heat sterilizer (dry heat oven) in each clinic, yet much remains to be improved. However, the

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high costs of the different infection control measures and the limited resources available may act as barriers to achieving the desired level of infection control in the MOH and HIO dental clinics.

Recommendations:

In view of the results of the present study, the following may be recommended:

1- More resources should be made available to ensure adequate supply of dental instruments, sterilizable handpieces, personal protection measures, as well as the various equipment and material necessary for cross-infection control.

2- Periodic training courses should be directed to dentists as well as dental assistants/nurses and laboratory technicians to train them in barrier techniques, universal precautions and other scientifically accepted infection control practices. Also, to up-date their knowledge

concerning the sources and modes of transmission of infectious diseases. Such training would assist them in delivering dental care to their patients in an environment free of infectious hazards.

3- Dentists and their staff should communicate the facts of infection control to their patients.

4- Vaccination of all dental health care workers against hepatitis B virus should be encouraged so as to protect both dental personnel and patients from the risk of getting infected.

5- Further research into the factors that may increase the risk for transmission of blood-borne pathogens and other infectious agents in dental practice should be instituted. The collected information would be helpful in the development and evaluation of improved designs for dental instruments, equipment and personal protective devices.

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Appendix (1): Checklist to assess the availability of the internationally recommended infection control measures in the different dental clinics.

Infection Control Measures	Availability		Infection Control Measures	Availability	
	Yes	No		Yes	No
I- Protective barrier techniques: 1- Disposable gloves 2- Disposable face masks 3- Protective eye-glasses/face shields 4- Clinic coats 5- Antiseptic handwash 6- Disposable towels			2- Autoclave 3- Dry heat oven 4- Glass beads sterilizer 5- Water boilers 6- Cold chemical disinfectants 7- Disposable needles 8- Instrument packaging 9- Sterilization monitoring		
II- Techniques for reducing bacterial transmission: 1- Antiseptic mouthwash 2- Rubber dam isolation 3- High speed evacuation system			IV- Surface and equipment disinfection: 1- Surface cleaners 2- Disposable covers		
III- Cleaning, disinfection and sterilization methods: 1- Ultrasonic cleaner			V- Patient evaluation as potential source of infection: 1- Presence of a medical record for each patient.		

إجراءات منع انتقال العدوى المتبعة في عيادات طب الأسنان بوزارة الصحة والتأمين الصحي بالإسكندرية

ما يمارس فعليا في العيادات التي خضعت للدراسة.

كما أظهرت النتائج مستوى منخفض لممارسات أطباء الأسنان في مجال منع إنتقال العدوى بالنسبة للمقترح دوليا. وقد وجد أن نسبة التطعيم ضد التهاب الكبد الوبائي كانت فقط ٥٩,٦٦٪ بين أطباء الأسنان بوزارة الصحة، و٤٤,٦١٪ بين أطباء الأسنان بالتأمين الصحي، كما وجد أن الكثير من الآلات المستخدمة يجرى تطهيرها بدلا من تعقيمها خصوصا خلال ساعات العمل، وقد تضمنت المعوقات عدم كفاية وسائل الوقاية الشخصية وعدم توفر العدد الكافي من الآلات والمعدات المستخدمة بالمقارنة للعدد الكبير من المرضى الذين يسعون للعلاج في هذه العيادات.

وقد أوضح البحث وجود بعض الإيجابيات في برامج منع انتقال العدوى المتبعة حاليا بوزارة الصحة والتأمين الصحي، ولكن يتبقى الكثير مما يمكن اضافته في هذا المضمار. وقد أعطيت توصيات شملت زيادة الميزانية الخاصة بشراء الآلات والأجهزة والمعدات اللازمة لمنع انتقال العدوى بعيادات طب الأسنان، والقيام بعمل دورات تدريبية دورية لأطباء الأسنان ومساعدتهم للتعرف على كل ما هو حديث في مجال منع انتقال العدوى، وأيضا تشجيع جميع العاملين في مجال طب الأسنان على التطعيم ضد التهاب الكبد الوبائي.

أجرى هذا البحث للتعرف على مدى كفاية إجراءات منع انتقال العدوى المتبعة بعيادات طب الأسنان التابعة لوزارة الصحة والتأمين الصحي بالإسكندرية، وعلى مدى أتباع أطباء الأسنان للقواعد والتوصيات المتفق عليها دوليا لمنع إنتقال العدوى وأيضا للتعرف على المعوقات التي تقف في طريق تطبيق الإجراءات المثالية.

وقد شملت عينة البحث عشرين من عيادات الأسنان التابعة لوزارة الصحة وسبعة وعشرين من عيادات الأسنان التابعة للتأمين الصحي بالإسكندرية، تم اختيارها عشوائيا، وقد اشترك في البحث ١٧٦ طبيب أسنان بوزارة الصحة و٨٣ طبيب اسنان بالتأمين الصحي، وقد قامت الباحثتان بزيارة كل العيادات التي اختيرت للبحث للإطلاع على وملاحظة الإمكانيات والأجهزة الخاصة بمنع إنتقال العدوى المتوفرة بالعيادات المختلفة باستخدام إستمارة أعدت خصيصا لهذا الغرض.

كما استخدمت استمارة استبيان سبق تحضيرها للتعرف على تصرفات وإتجاهات أطباء الأسنان بالعيادات المختلفة ورؤيتهم الشخصية بالنسبة للطرق المختلفة المتبعة لمنع إنتقال العدوى. وأيضا للتعرف على المعوقات المختلفة التي تحول دون استخدام الطرق المثالية. وقد أظهرت نتائج البحث تباين واضح بين الاجراءات المقترحة دوليا وبين