Annals of Epidemiology & Public Health

Compliance of Dentists with Infection Control Practices in Primary Health Care Centers in Gaza Strip, Palestine

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Abstract

Background: Infection prevention and control of cross-contamination are essential in providing a secure environment for patients and healthcare workers within healthcare settings in general and more specifically in dental practices. The aim of the current study was to determine the level of compliance of dentists with infection control in primary health care centers in Gaza Strip (GS).

Method: Descriptive cross-sectional study was conducted. All the population of dentists (90 dentists) in Primary Health Care Centers (PHCs) of Ministry of Health (MOH) were recruited in the study. The aceptance rate among dentists was 100% from 26 dental clinics in Gaza Governorates. The data were collected by checklist that consist of 28 items about infection control divided in seven domains other than personal information: Hand Hygiene "HH", Personal protective Equipment "PPE", Sterilization & Disinfection of patient-care tools "SDT", Environmental Infection control "EIC", Dental Unit Waterlines "DUW", Dental Hand-pieces "DHP" and Discarding "D". Permission was obtained from the MOH. The dentists weren't knowing that they were under observation during data collection by trained nurses. Collected data were analysed using Statistical Package for Social Science Progrm and appropriate statistical procedures such as frequency distribution tables, and central tendency and dispersion measurements.

Findings: The level of compliance of dentists with infection control was high, where the highest domain was the discarding with very high level, while the lowest one was the dental hand-pieces with moderate level. There was significant difference in the level of compliance according to qualification, where the compliance level among dentists with master degree was higher than those of bachelor degree in general. Also there were significant inverse correlations between compliance and both age and years of experience of dentists.

Conclusion: The level of dentists' compliance in primary healthcare centers with infection control was high. But there was need to focus on enhancing some practice such as; changing masks between patients, providing patients napkins, and dentrist's wearing aaporiate eye protection during work by increase the awareness of old age dentists with bachelor degree.

Introduction

The oral cavity is a natural habitat for a large number of microorganisms. In dentistry, these microorganisms may pose a risk for cross-contamination and infection. It is also important to consider that the pathways of contamination are bi-directional. Both patients and Dental Health Care Personnel (DHCP) may be exposed to a number of pathogens through exposure to blood and saliva [1]. In addition, the hands of DHCP may serve as a reservoir for pathogens, including multi-resistant strains [2,3]. Infection control forms an important part of practice for all health care professions and remains one of the most cost-beneficial medical interventions available [4]. Professional dental associations and professional health agencies have advocated that universal precautions be applied to all patients, as their potential infectivity may not be known [5]. WHO defines Infection Prevention and Control (IPC) as "a scientific approach and practical solution designed to prevent harm caused by infection to patients and health workers. It is grounded in infectious diseases, epidemiology, social science and health system strengthening" [6]. Infection continues to be one of the most critical issues in healthcare service worldwide. Infection prevention and control of cross-contamination are essential in providing a secure environment for patients and healthcare workers within healthcare settings in general and more specifically in dental practices. Transmission of infection during dental procedures may occur through direct contact with saliva, oral fluids, or blood, airborne droplets containing infective agents, or indirect contact via contaminated objects (e.g., instruments, equipment, or environmental surfaces) [7]. Exposure to blood-borne pathogens like Human Immunodeficiency Viruses (HIV) and hepatitis B and C viruses (HBV and HCV) is a constant risk and therefore high standard precautions must be implemented and followed for all patients attending dental clinics regardless of their infection status [1]. Other infective agents such as Herpes viruses, varicella-zoster virus, *Mycobacterium* spp., *Pseudomonas* spp., *Legionella* spp., and multi resistant bacteria such as *Staphylococcus aureus* are scarcely documented but constitute additional risks of cross contamination in dentistry [8]. Several healthcare bodies, agencies, and dental associations like the Centers for Disease Control and Prevention (CDC), Occupational Safety and Health Administration (OSHA), American Dental Association (ADA), the National Institute of Health and Clinical Excellence (NICE), and others have released guidelines to regulate infection control in the United States and other developed countries [9]. The CDC issued guidelines for infection control in dental clinics. These recommendations include standard precautions which aim at ensuring a safe working environment and preventing potential transmission of occupational and nosocomial infections among dental personnel and their patients [10]. Many infectious diseases are transmitted to dentists working in the Palestinian MOHq during their work in dental clinics. It was noted that there is a high rate of disease infections in the Gaza Strip and that there is a decrease in compliance and application of infection control principles. Compliance with effective infection control practices by dental healthcare providers may be affected by several factors such as knowledge and educational background [11], costs and lack of incentives, sociodemographic and professional variables [12], and availability of and access to required materials and equipment [13]. Wide variations have been reported between developed and developing countries relative to infection prevention and control [14]. While several reports and systematic reviews have been published relative to compliance with infection control, practices in dental healthcare of developed and developing countries [15], the surveys are limited in Gaza Strip. So, this study will be conduct to evaluate the infection control practice in dental clinics in MOH primary health care centers in Gaza Strip.

Material and method

Study design

Primary health care centers based cross-sectional study was conducted.

Study setting

This research was carried out at all MOH PHC$_s$ dental clinics in five Governorates of the Gaza Strip (26 dental clinics).

Study population

The target population of the study included all the dentists were working in the MOH PHC$_s$ dental clinics in Gaza Strip during the period of data collection (90 dentists).

Eligibility criteria

The observation of infection control practice in the clinic was carried out only for dentists who were working in MOH PHC$_s$ dental clinics, so that assistant dentist, dental nurses, and dental technicians were excluded in this study.

Period of the study

The data were collected during eight months, starting from July 2019 to March 2020, where three dentists were observed per week during their working hours along workday, with an average of 10-12 doctors per month.

Data collection tools and techniques

A twenty-eight items structured Checklist divided in seven domains was developed by the researchers based on feedback from panel of experts in this field. The checklist composed of eight parts include personal information, Hand Hygiene (HH), Personal protective Equipment (PPE), Sterilization & Disinfection of patient-care tools (SDT), Environmental Infection Control (EIC), Dental Unit Waterlines (DUW), Dental Hand-Pieces (DHP) and Discarding (D) (annex 1). The process of development of valid and reliable checklist passed in four stages (annex 2). First, the development of draft checklist was based on literature review and experts' guidelines (annex 3), where the draft consisting 24 items. Second, by three rounds Delphi technique through e-mail , seven multidisplinary experts of enviromdent, Medicine, and public health reviewed the draft and achieved a concensensus about all the items in the list (28 items) through deleting and adding some items. Thirdly, the final draft was designed after conducting pilot study on ten dentists to idntify ambiguous formulated items that can not clearly observed and in order and grouping of items. Finally, Final review round was conducted to ensure experts' consensus concerning changes made in the

third step. All seven experts agreed with all minor adjustments made in the third step. This method reduces opportunities for subjective interpretations and thus minimizes rater biases. Translation process of the study tool (Checklist) was done via a structured method to ensure the reliability of the tool. After Permission from MOH had been obtained, the dentists' practices toward infection control were observed by high qualified and trained nurses. The items of infection control compliance for each dentist were uudged after continuous observation of dentists' practices toward infection ncontrol measures along the workday hours.

Pilot study

Pilot testing was done prior to the beginning of data collection to check validity and realibility of the checklist and to evlute the acceptance of the dentists. Piloting was done for 10 dentists. The ten dentists were selected from five dental clinics of MOH PHC centers in the five governorates of Gaza Strip through 3 weeks. The researchers conducted the pilot observations and evaluated the sustainability of checklist. There were no major changes in the checklist. Therefore the pilot dsntists were included in the study.

Validity and reliability

The validity of the the study tool (checklist) was examined by content validity and internal consistency validity. The content validity was evaluated by a group of multidisciplinary experts. The domains were designed and the items were modified according to experts' opinion. Also the internal consistency validity was evaluated by Spearman Brown correlation to determine the validity of every item and domain after conducting the pilot study. The correlation coeefficients between every domain and over score of compliance were measured, then the correlation coeefficients between every item and the score score of domain were measure. The degree of correlations between the items and domains and between the domains and over score of compliance were significantly high 0.65-0.83).

Personnel

Data were collected by six high qualified and trained nurses on performing the observation of the items and asking the questions of checklist in a technical manner. The nurses had been trained by the principal investigator on how to use the tool and the mechanism for observing the practice of dentists during their worktime and treatment of patients, where none item of checklist was judged except after treating at least five patients in the clinic and this is to reduce the variance in the process of the observation (measurement) that can result from the variation in the observation (inter-observer and intra-observer) variation. This had done to confirm the high reliability of measurements and to obtain accurate and productive data for the observer. Also the observers (nurses) were monitored by the researchers.

Study variables

Dependent variable

Compliance with infection control

The level of compliance of dentists with infection control was measured by the average of WP of the seven domains of the checklist related to infection control; Hand Hygiene (HH), Personal protective Equipment (PPE), Sterilization & Disinfection of Patient-Care Tools (SDT), Environmental Infection Control (EIC),

Dental Unit Waterlines (DUW), Dental Hand-Pieces (DHP) and Discarding (D). The average of WP of the seven domains was calculated by multiplying the WP of each domain by the number of each domain's items then dividing on 2800 points (the highest score of WP). The WP of each domain was calculated by dividing the score of each domain over the highest score of domain then multiplied by 100, where the highest score of domain was calculated by multiplying the number of items of each domain by the highest score of each item, on other hand the score of each domain is calculated by multiplying the score of each item in the domain by the number of items in each domain. Also The WP of each item was calculated by dividing the mean of each item over the highest score for each item) multiplied by 100.

Likert five-scale was used to determine the compliance level of dentists, where the length of ech class was determined by calculating the range of scores (5-1=4),then dividing the range over the highest score to get the length of each class (4/5=0.8), then adding the length of the class to the lowest score (1) to determine the maximum limit of the first class (1.8) and so on. The level of complince was classified according to the WP as shown in (Table 1).

Table 1: Likert five-scale of level of compliance.

Compliance Level	Class length	WP
Very Low	1-1.79	20-35.99%
Low	1.8-2.59	36-51.99%
Moderate	2.6-3.39	52-67.99%
High	3.4-4.19	68-83.99%,
Very High	4.2-5	84-100%

Independent variable

Socio-demographic variables

The sociodemographic information of dentists such as; gender , age, qualification, years of experience, position of dentist and Governorate of PHC centeres were collected by face to face interview done by the medical students not by the nurses. The age and the years of experience were determined by years, while the qualitative varaibles such as gender, qualification, Position of dentists and Governerate of PHCcenter was determined by asking the dentists to select one of diffrent alternatives against each varible in the checklist as shown in annex 1.

Statistical analysis

Collected data were reviewed for completeness and accuracy, coded, computed and analysed using Statistical Package for Social Science Progrm (SPSS version 22) and appropriate statistical procedures. Data processing also included scoring the variables related to infection control compliance. To insure the accuracy and completeness of all questions and items, frequency distribution was done for entire data. Descreptive statistics were used for summerizationof data utilizing frequency distribution tables with percentages for qualitative variables. For quantiataive variables such age and years of experience, mean and standard deviation were calculated. Comparison between different groups of qualitative variables such as gender, qualification, position and of dentists and governorates of PHC centers according to the average of the level of compliance with infection control was done without using the inferential tests such as t-test or ANOVA teat, because the population of study

was all the dentists of MOH PHC centers. Correlation and linear regression test was used to extract the correlation the regression formula between the quantitative variables of sociodemographic information of dentists and the average of WP of compliance. The formula of linear regression test was extracted to predict the level of complince of dentists according to age and years of experience.

Ethical consideration

The study protocol was approved by the written permission was sought and granted by the Palestinian ministry of health to conduct the study in all the dental clinics in primary health care centers. Also, the researchers have sought approval from Palestine University. Likewise, dentists consent was gained after Finishing the data collection about their compliance by observation and they were not obliged to be involved in the study if they did not like to shre in the study and were free to cancel the documented observed items about their activity and skills during their practice in the clinic.

Limitation of the study

This study had numerous limitations; first: other independent factors that may affect the dentists' compliance of infection control practice were not studied such as. Second, The researchers have effort during data collection because absence of some dentists during their worktime, so the researchers had to return to the same clinics more than one time. Third, cross-sectional design of the current study limited the investigation of causal-effect association.

Table 2: Summary of dentist's characteristics Gaza Strip, 2019-2020.

Variables	Frequency	Percent/Value (Mean•)
Accept to participate	90	100.0%
Gender		
Male	68	75.6%
Female	22	24.4%
Age (years)		
Years of dentists	90	42.8 Years•
Governorates		
North Gaza	11	12.2%
Gaza	39	43.3%
Middle zone	14	15.6%
Khan-Younis	14	15.6%
Rafah	12	13.3%
Dentist's Qualification		
Bachelor	86	95.6%
Master	4	4.4%
Experiences (years)		
Years of experience	90	18.7 Years•
Dentist's Position		
Head of deparment	26	28.9
General Practitionar	64	71.1
Total	90	100.0

• Quantitative variable

Results

Scocio-demographic Characteristics of study population

The study population was 90 dentists from 26 dental clinics of MOH PHCs in the five governorates of GS. The acceptance rate was 100%, where all of dentists of MOH PHCs accept to be involved in the study. The average age of the dentists was 42.8 years, where 75.6% of them were male. Most of the dentists were from Gaza city Clinics with 43.3%, but the lowest Percentage of dentists were in Rafah clinics with 12.2%. The average years of experience of dentists was 18.7 years. The dentists with bachelor degree were 86 (95.6%), while dentists with master degree where only of 4 with a percentage of 4.4%. According to work position of dentists, 71.1% of them were general practitioner, while 28.8 were head of department as shown in (Table 2).

Level of compliance with infection control among dentists

The study revealed that the level of dentists' compliance towards infection control practice was high with WP (82.0 ± 5.9), where the highest domain of compliance with infection control was the Discarding (D) with very high WP (90.0 ± 5.9), while the lowest domain was the Dental Hand-Piecesn (DHP) with moderate WP (64 ± 14.1) then, the Personal Protective Equipments (PPE) with high WP (72 ± 6.8) as shown in (Table 3). The level of compliance regarding to Hand Hygiene (HH) was very high with WP 88%, Where the WP of washing of hands before and after treating the patients was very high (90%) and that of hand rubbing by alcohol was very high (84%).

Regarding the level of compliance toward Personal Protective Equipment (PPE) was high with WP 72%, Where the WP of wearing gloves in every procedure and changing it between patients was very high (98% and 100% respectively), while that of the using of protective eye glasses and providing the patients napkin was very low with WP 32% for both, Also the WP of changing the mask between every patient was moderate (58%). The level of compliance according to Sterilization and Disinfection of Patient Care Tools (SDT) was very high with WP 88%, Where the level of availability of central instrument processing area in thecllinic was very high wit WP 96% and the level of removing visible blood stains before autoclaving was also very high with WP 92%, but that of needles recapped in a safe technique (one hand technique) was high with WP 80%. Regarding to Environmental Infection Control (EIC), The level of compliance was very high with WP 84%, Where the WP of changing protective barriers for every patient was vey high with WP 92%, while that of utilizing the appropriate products for cleaning and disinfecting clinical contact areas was high (80%). According to Dental Unit Waterlines (DUW), the level of compliance was high with WP 76%. The level of infection control compliance according to dental hand pieces was the lowest with a WP 63.3%, Where the using a sterile hand piece for every patient was uncommon.This is probably due the limited number of hand pieces along with lack of Knowledge about measures of sterilization. Beside the inavailability of biomedical engineers for maintenance. Finally, the level of compliance regarding to discarding was the highest with a WP 90%. Where the level of discarding needles and sharp instruments in safety box, and taking off gloves correctly and discarding them on opposite side was very high with WP (90% for both) as shown by (Table 3). Also (Figure 1) showed the descending order for the level of inection control compliance domains among MOH PHCs dentists.

Table 3: Averages & weight percentages of infection control's compliance among dentists in Gaza Strip, 2019-2020.

| Items of Infection Control	No.	Average	Standard Deviation	Weight Percentage	Level of Compliance
1. Hand Hygiene (HH)	90	4.4	0.58	88	Very high
1.1. Do clinic personnel perform hand hygiene before and after treating patients?	90	4.5	0.56	90	Very high
1.2. Are alcohol hand rubs available?	90	4.2	0.91	84	Very high
2. Personal Protective Equipment (PPE)	90	3.6	0.34	72	High
2.1. Do clinic personnel wear protective clothing and change when necessary?	90	4.2	0.76	84	Very high
2.2. Is protective clothing removed before leaving the clinic?	90	4.4	0.74	88	Very high
2.3. Do clinic personnel wear masks during treating patients?	90	3.5	0.81	70	High
2.4. Do clinic personnel change masks between patients?	90	2.9	0.74	58	Moderate
2.5. Are gloves appropriate for treatment available in sizes required?	90	4.3	0.89	86	Very high
2.6. Do clinic personnel wear Gloves during treating patients?	90	4.9	0.31	98	Very high
2.7. Do clinic personnel change Gloves between patients?	90	5	0	100	Very high
2.8. Do clinic personnel wear appropriate eye protection?	90	1.6	0.87	32	Ver low
2.9. Do clinic provide patient Napkin?	90	1.6	0.85	32	Very low
3. Sterilization and Disinfection of Patient-Care Tools (SDT)	90	4.4	0.37	88	Very high
3.1. Is there a central instrument processing area available for the office?	90	4.9	0.493	98	Very high
3.2. Are visible blood and debris removed from instrument prior to sterilization?	90	4.6	0.57	92	Very high
3.3. Are instruments wrapped appropriately before sterilization?	90	4.4	0.79	88	Very high
3.4. Is sterilization equipment properly monitored and records maintained?	90	4.3	0.79	86	Very high
3.5. Are all wrapped instrument packages inspected to ensure they are intact?	90	4.3	0.76	86	Very high
3.6. Does dentist use disposable needle for every patient?	90	4.4	0.7	88	Very high
3.7. Are Needles recapped in a safe technique (one hand technique)?	90	4	0.76	80	High
3.8. Do dental personnel follow general safety precautions with sharp instruments?	90	4.3	0.74	86	Very high
3.9. Dentist use sterile instruments for each patient?	90	4.2	0.92	84	Very high
4. Environmental Infection Control (EIC)	90	4.2	0.36	84	Very high
4.1. Are clinical contact surfaces disinfected or barrier protected for each patient?	90	4.1	1.07	82	High
4.2. Are surface barriers changed between patients (Napkins ,wrapping)?	90	4.6	0.65	92	Very high
4.3. Are appropriate products utilized for cleaning and disinfecting clinical contact areas?	90	4	0.7	80	High
4.4. Are plastic cups changed between patients ?	90	4.3	0.81	86	Very high
5. Dental Unit Waterlines (DUW)	90	3.8	4.24	76	High
5.1. Is the water flushed (handpieces, ultrasonic scalers, and air/water syringes) for 20-30 seconds after each patient?	90	3.8	4.24	76	High
6. Dental Handpieces (DHP)	90	3.2	0.71	64	Moderae
6.1. Are handpieces cleaned, disinfected, lubricated, and sterilized between patients?	90	3.2	0.71	64	Moderate
7. Discarding (D)	90	4.5	0.47	90	Very high
7.1. Are needles & sharp instruments discarded in safety box ?	90	4.5	0.69	90	Very high
7.2. Are gloves taken off correctly and discarded on opposite side?	90	4.5	0.8	90	Very high
Total Compliance	90	4.1	0.3	82	High
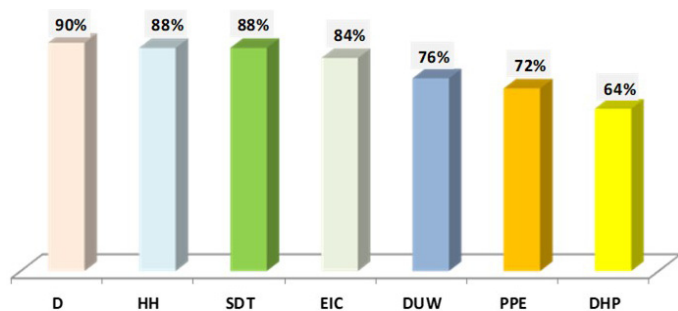
Figure 1: Levels of Infection control complince domains by weight percentage among dentists of MOH PHCs in Gaza Strip, 2019-2020.

Relationship between infection control compliance levels and socio-demographic variables

It is observed that there was no high differences in the level of complince with infection control in general according to socio-dempgrphic variables among MOH PHC dentists except according to qualification, age and years of experience. The WP of compliance among dentists with bachelor was 82%, while tht of master was 88% as shown in (Table 4 and Figure 1). Also the results of current study revealsed that there is significant inverse proportion between both age and years of experience and the level of compliance (R= -0.240, and R= -0.232 respectively), where the level of dentists' compliance decreased with the increase in age and years of experience as shown in (Figure 2&3). Regarding the gender, there were not high differences in the level of compliance with infection control domains between males and females except in Dental Unit of Water (DUW), where the male were flushing the water to handpieces, ultrasonic scalers, and air/water syringes more tnan females with WP (78% among males, and 70 % among females) as shown in (Table 4).

According to governorates, Some domains of infection contro measures were more practiced with dentists of North Gaza Governorate's PHCs compared other governorate's PHCs such as Personel Protective Equipment (PPE), and enviromental infction control (EIC). On other hand there were some domains of infection control less practiced by dentists of North Gaza governorates's PHCs compared to other governorates PHCs such as Hand Hygine (HH) and Discarding (D). But in general there was no significant differenc in the level of infection control compliance among dentists according to governorates as shown in (Table 4). It was clear that there were high differences in the levels all domains of infection control compliance between the dentists of bachelor degree and those of master degree in favor those of master degree as shown in table 4 and (Figure 2). Regarding the job position of dentists, in general there was no evident differenc in the level of compliance with infection control among PHCs dentists. But some domains were more practiced by head of department dentists than general practitiner dentists such as Dental Unit of Water (DUW) meausres (78% fead of department dentists, and 68% general practioner dentists). On other hand, there wer some domains practiced more by grnerl prctiononer dentists more than head of departmet dentists such as Discarding (D) (92% generalpractioner dentists, and 86% head of department dentists) as shown in (Table 4). The scatter plot in figure 3 and 4 revealed that the level of compliance among dentists of MOH PHCs in Gaza strip could be predicted significantly according to age and years of experience of dentists respectively by the following regression formulae:

Level of compliance with infection control= 89.1 − (0.19 * age of dentist)

Level of compliance with infection control= 84.4 − (0.19 * years of experience of dentist)

Table 4: Averages &weight percentages of infection control domains' compliance by socio-demographic variables among dentists in Gaza Strip, 2019-2020.

| Variable (n)	HH		PPE		SDT		EIC		DUW		DHP		D		Total Compliance	
	Av.	WP	Av.	WP	Av.	WP	Av.	WP	Av.	WP	Av.	WP	Av.	WP	Av.	WP
Gender (90)																
Male (68)	4.4	88%	3.6	72%	4.4	88%	4.3	86%	3.9	78%	3.2	64%	4.5	90%	4.1	82%
Female (22)	4.4	88%	3.8	76%	4.3	86%	4.2	84%	3.5	70%	3.1	62%	4.5	90%	4.1	82%
Governorate (90)																
North Gaza (11)	4.1	82%	3.8	76%	4.5	90%	4.5	90%	3.2	64%	3.2	64%	4.2	84%	4.1	82%
Gaza City (39)	4.3	86%	3.8	76%	4.2	84%	4.1	82%	4.5	90%	3.1	62%	4.6	92%	4.1	82%
Middle Camps (14)	4.5	90%	3.5	70%	4.5	90%	4.4	88%	4.5	90%	3.1	62%	4.6	92%	4.1	82%
Khanyounis (14)	4.5	90%	3.6	72%	4.5	90%	4.2	84%	3.4	68%	3.3	66%	4.6	92%	4.1	82%
Rafah (12)	4.5	90%	3.3	66%	4.5	90%	4.2	84%	3.2	64%	3.1	62%	4.2	84%	4.0	80%
Qualification (90)																
Bachelor (86)	4.4	88%	3.6	72%	4.4	88%	4.2	84%	3.8	78%	3.2	64%	4.5	90%	4.1	82%
Master (4)	4.8	96%	4.0	80%	4.6	92%	4.6	92%	4.0	80%	3.5	70%	4.9	99%	4.4	88%
JobPosition (90)																
Head of Department (26)	4.3	86%	3.6	72%	4.4	88%	4.1	82%	3.9	78%	3.2	64%	4.3	86%	4.1	82%
General practitioner (64)	4.4	88%	3.6	72%	4.4	88%	4.3	86%	3.4	68%	3.1	62%	4.6	92%	4.0	80%
Total	4.4	88%	3.6	72%	4.4	88%	4.2	84%	3.8	76%	3.2	64%	4.5	90%	4.1	82%
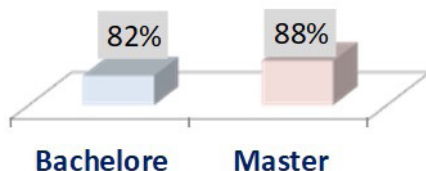
Figure 2: Difference in level of dentists' compliance with infection control according to qualification.
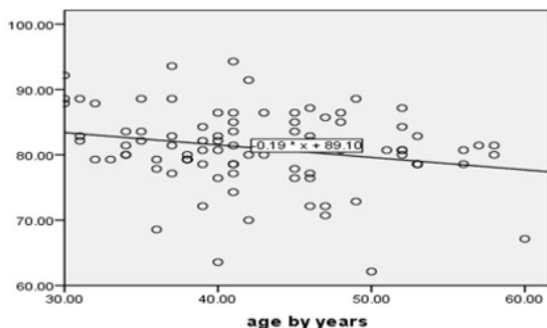

Figure 3: Correlation & Regresion between age and level of compliance with infection control among dentsists, Gaza, 2019-2020.
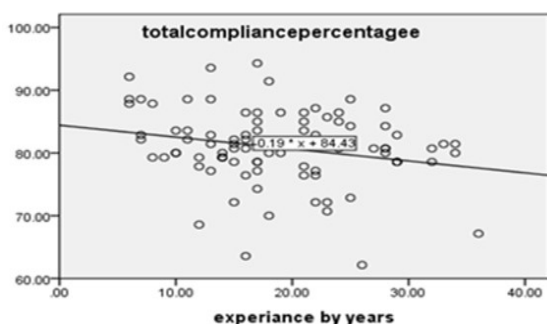

Figure 4: Correlation & Regression between experience years of dentists and complince with infection control, Gaza, 2019-2020.

Discussion

Adherence to infection control and prevention practices is one of the most priority in any dental health care setting. The infection prevention coordinator should be responsible for developing written infection prevention policies and procedures based on evidence-based guidelines, regulations, or standards. The present study is a cross-sectional investigation, which was conducted among dentists who working in dental primary health care clinics. The current study aimed to assess the compliance of dentists with infection control practices in the dental clinics of PHC centers. The most dentists in the present study were male. This finding is consistent eith the result ofprevious study in Gaza in Palestine conducted by [16]. This reflects the male culture in Palestinian society, where the preference for the male gender is rather than professional standards in employment and different aspects of life. Regarding the qualification,the most dentists in this study were of Bachelor degree and the average age of dentists' population was 43 years. This average is higher than that reported in other studies such as [17,18] which conducted in West Bank in Palestine which showed that the age average of dentists were around 30 years, While it was consistent with that of [19] study in Tanzania. The high average of dentists' age in dental clinic of primary health care centers in Gaza strip, and not upgrading their

academic and professional qualification could be attributed to a large proportion of dentists who graduate from universities travel to other countries to get the appropriate job as a result of inavilability of of job opportunities in the government health sector during the last decade, because of the low economic level and its bad impact on all development and service sectors resulting from political and security instability in Palestine as a result of the repeated aggression on the Gaza Strip and the division between the Palestinian factions. The compliance level of dentists toward infection control practice was high. The results of current study could be attributed to that health care professions get many training courses focus on safety guidelines and infection control protocols in the Gaza Strip. This finding was consistent with many studies conducted in Arabian countries such as Saudia arabi, Jordan and Egypt which revealed that the majority of dental students, prctitioners and professionals were found to be in compliance with most of the investigated and recommended infection control measures and regulations [20-22]. On other hand, findings of some previous studies were inconsistent with the finding of the current study according to compliance with infection control which revealed that low percent of general dentists were considered to be compliant with the recommended infection control measures in Private clinics in Jordan, in Durban, in Lebanon and in Iran [4,13,23,24], and among dental students in Pakistan, and in India, [25]. Regarding the highest levels of infection control compliance domains among MOH PHCs dentists in the current study; Discarding (D), Hand Hygine (HH) and Sterilization and Disinfection of Patient-Care Tools (SDT) were very high levels. The findings of the present study have concluded that the levels of discarding the needles, sharp instruments in safety box, taking off and discrding the gloves correctly, performing hand hygine and all the items of sterilization and disinfection of patient care tools were very high. This result could be attributed for many factors. One of these factors is an attendance of dentists to the workshops and scientific days focusing on safety guidelines and infection control protocols in the Gaza Strip which administered by MOH, UNRWA, and some NGOs agencies. The other factor is an availability of materials and instrument such as; safety box, disinfectant materials and solutions such as alcohol and chemical detergents for instrument sterilization, autoclaves, and water supply inside the dental clinics which encourage the dentists to obey the precautions of infection control. The results of the current study regarding the highest domains of infection control compliance were matched with some studies conducted in Palestine [26] and neighboring countries such as Jordan, Lebanon, Suadi arabia and India [20,21,24,27] which identified that hand washing, wearing and changing gloves occurred among 75-98 % of the physicians with direct contact with patients. Also some studies support the high level of compliance toward Discarding (D) and SDT which confirmed by the current study such as [20,21] which reflected that 70-90% of the respondents discarded sharp objects in special container. On other hand the results of this study according the highest domains were not matched with al-Omari study results which conducted in Jordan and reported that many dentists don't wash their hands between changing gloves and after removal of gloves [4] (al-Omari et al, 2005), and not matched with the results confirmed by Abu Zaid study, which showed that the percentage of washing hands among the dentists in dental clinics of UNRWA centers was low (35.0%) [28]. Also regarding the discarding and SDT, many studies reported that low percentage of dentsists used an appropriate methods in discarding the sharp objects or sterilizing and disinfecting the instruments [16,23,29].

Regarding the lowest level of infction control compliance domains; Dental Hand Piece (DHP), Personal Protective Equipment (PPE), and Dental Unit Waterlines (DUW) were ranging from moderate level to high level. This reltive low level of compliance in these domains among dentists of MOH PHCs in GS compared to other domains could be attributed to three main factors, one of these factor is the over workload in dental clinics of MOH PHCs which restricts the chance for practicing some infection control precautions related to PPE, DUW and DHP by the dentists. This because the dentists does not think that wearing ane eye protective, wearing and changing the masks, or providing the patients with napkin has the priority as hand washing and wearing and changing of gloves as an infection cntrol measure. The second factor could be the shortage supplying the dental clinic by the material of PPE specially the eye protective glasses, the masks, and the napkins. the last factor is that the dentists have poor skills of cleaning and washing the Dental Hand Piece (DHP) correctly, so the DHP and DUW are more vulnurible to misuse and disable. Further education and training may be appropriate in flushing and dental unit waterlines care. Also, the necessity for recruitment of more engineers in the field of biomedical engineering in dental clinics of primary health care to guarantee continuous maintenance of DUW. Iincreasing the availability of hand pieces and autoclaving machines to ensure better compliance is recommended to MOH. The findings of the current study regarding the lowest domains of infection control compliance were matched with most studies have addressed the infection control issue and conducted in Romania, in Jordan, in Durban, and in Saudi Arabia [4,20,21,23,29], which stated that a low percentage of dentists were compliant to wear protective eye glasses, to autoclacave and change the Dental Handpiece (DHP). Also these studies recommended that further education is needed to improve some infection control measures including wearing eye glasses and face shields, and disinfecting materials. Moreover It is very important this period with emerging Corona virus wirh COVID-19 disease pandemic to increase the campaigns of education in different media about the importance of implementing universal source control measure as Control of Disease Center (CDC) guidance which stated that DHCP should wear a surgical mask, eye protection (goggles or a face shield that covers the front and sides of the face), a gown or protective clothing, and gloves during procedures likely to generate splashing or spattering of blood or other body fluids , and they should should continue to adhere to Standard Precaution (CDC, 2020). The current study revealed that the qualification of dentists was the main professional variable affect the dentists' compliance with infection control practice, where the levelof compliance among dentists with master degree was higher than that of bachelors. This difference in the compliance level is attributed to the awareness about the serious infections that would spread among dentists along with increased responsibility towards the society among the dentists of high qualification. This finding agree with the result of [13] study which conducted in Iran and showed that dental practitioners working in Mashad governmental dental health care centers with less educational level had a low level of infection control practice. However, there was a disagreement between the current study and the study of [13,24] regarding the years of experience, as Less compliance was shown by clinicians with fewer years of experience in both studies [13,24], while the current study confirmed the inverse relationship between years of experience and the level of compliance with infection control practice. It is clear that the reason of the difference between the current study and other studies was the age of dentists. The average age of dentists in this study was older than the averge age of other studies. Also most of the dentists of this study were of bechlor degree. Both old age and low qualification reflect that there was no development in educational level among the Palestinian dentist during his career, while in other countries such as Iran and Lebanon the percentage of dentists with high educational level with low average age was more than that in the current study. This again demonstrates that the qualification is an important factor in increasing the level of compliance with infection control among health care practitioners.

Conclusion

The level of of dentists compliance with infection control in MOH PHCs was high, The highest domain was the Discarding (D), while the lowest was the Dental Hand-Pieces (DHP). the level of compliance with infection control increased with increasing the qualification, while it decreased with increasing the years of experience and ages. It is recommended that MOH have to keep Continuous hiring for new generations and young dentists in PHCs to ensure that medical information and practices in the field of dentistry are updated. Also it is necessary to focus on continuing education and training for old doctors about Infection control precautions and procedures such as wearing PPE and disnfecting and sterilization specially in this period with emerging Corona virus with COVID-19 disease Pandemic.

Acknowledgement

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