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Survey of the Use of Personal Protective Equipment and Prevalence of Work-Related Symptoms among Dental Staff

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Abstract

Background: Dental professionals are exposed to various health hazards in their day-to-day practice. They are prone to be affected by constant exposure to allergic reactions to various dental materials used in dentistry and production of dental aerosols during ultrasonic scaling present a potential route for disease transmission.

Aim & Objective: To assess various personal protective measures (gloves, mask and eye shield and surgical gowns etc) adapted by dental professionals and to investigate the risk of work-related symptoms among dental professionals.

Material & Methods: A cross-sectional study was conducted on 150 practicing specialized dental practitioners, general dental practitioners and dental hygienists from Chandigarh city, chosen by random sampling. All the participants filled the questionnaire Performa which includes the questions related to their personal protective measures employed by the dental practitioners and dental hygienists and work-related symptoms (Upper and lower respiratory tract, skin and eye symptoms). The Performa was distributed through electronic media. Data were analyzed by multiple logistic regression analysis using SPSS software 20.

Results: Among the dentists, who participated in the study, 47.3% were males and 52.6% were females, the maximum number of dentists was in the age group of 25–35 years and 44.8% held a master degree. 68.1 % dental professionals always wear face mask as well as surgical / examination gloves throughout their clinical hours. Majority of dental professionals have an excellent experience while doing any dental procedure or surgery. When work related symptoms were assessed one third of dental professionals complains of respiratory infection, eye irritation and skin problems. The respiratory infection such as cough and phlegm (17.1%), shortness of breath (25%), wheezing sound (22.2%), sore throat and

hoarseness of voice (27.5%) and blocked or running nose (16.1%).

Conclusion: Awareness regarding these occupational hazards and implementation of preventive strategies can provide a safe working environment for all the dental personnel. The dental personnel should be aware of all signs of symptoms of hazards and the strategies to prevent and control them.

Keywords: Personal protective equipment, Dental work related symptoms, Occupational hazards, Safety in dental environment.

Introduction

Dentistry is one of the disciplines of health care that deals extensively with body fluids like saliva, blood and gingival crevicular fluid. They are prone to be affected by constant exposure to various dental materials, noise from various equipment besides work-related stress directly related to patient management. The frequent exposure to infectious agents can also pose for major risks for the dentists. Till 1970's, many dentists perform dental procedure with little or no knowledge of personal protection equipment and perceived risk of infection was thought to be very low. Only a few dentists wore operating and surgical gloves, masks and eyewear's.[1]

Occupational health complaints such as dermatosis, ocular lesions, respiratory and systemic complaints, skin allergies, and infections are very common type of cross infection in dentistry. Dental professionals are exposed to number of occupational hazards which can be biological (e.g. bacteria, viruses), chemical (e.g. acrylates, metals such as mercury), physical (noise. radiation) & psychosocial (e.g. shiftwork and stress work).[2] Airborne transmission may occur only if dental procedures generate aerosols and splatter production. These aerosols may contain particles that may travel much longer distance and remain airborne for longer duration. Droplets and airborne transmission are relevant to each other during tracheal intubation. Respiratory particles may spread while breathing, coughing and sneezing. The size of the particle, their site of origin in the respiratory tree, their infective load and capacity will vary during these activities. Splatter particles, moving along trajectories, can reach the dental personnel as the range of splatter is from 15 to 120 cm.[3] Particles less than 50 μm are small enough to stay airborne for an extended period before they settle on environmental surfaces or enter the respiratory tract. The smaller particles of an aerosol (0.5 to 10 μm in diameter) have the potential to penetrate and lodge in the smaller passages of the lungs and are thought to carry the greatest potential for transmitting infections and other health effects on the airways.[4]

Recent evidence of epidemiological studies indicated that contamination of dental surgeries with aerosols is the cause of increased prevalence of respiratory infections among dental professionals. Asthma is a chronic inflammatory disorder of respiratory tract that is characterized by reversible airflow production, bronchial hyperresponsiveness, airway inflammation and airway remodeling The common symptoms include wheezing sound with chest tightness, breathlessness and coughing and there is an increase in the prevalence of this chronic inflammatory disorder more commonly due to environmental factors which also includes work place exposure among dental professional. In addition, methyl methacrylate, which is used in dental cement, can induce mucous irritation, allergic reactions, hypersensitivity, asthma reactions, nerve symptoms, and skin diseases, among others.[5] Jang reported that 46.5% of respondents complained of coughing due to alginate or stone dust inhalation and 61.1% of experienced respondents complained of coughing.[6]

Nowadays, scenario has been totally changed and there is an increase in awareness of personal protection and cross infection control from both dental professionals and patients has changed this perception. Personal protective equipment is reported as the last line of defense from airborne contamination when all the aforementioned measures fail to reduce contamination to an acceptable level. The main parts of P.P.E kit are face mask, head cap, gloves, surgical gown, protective eye shield. These are designed in such a way that they protect the operator from contamination by aerosols and splatter production to skin and mucous membrane. They also block the portal of entry of pathogenic microorganisms such as streptococcus, mycobacterium tuberculosis, hepatitis B virus, Herpes simplex virus and HIV virus during direct or indirect contact with body fluid, saliva or blood. Surgical masks and Surgical respirators hold strategically clinical importance. Surgical masks are defined as "a loose-fitting, disposable type of facemask that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment." Masks offer some degree of fluid resistance and protect the wearer from splashes, sprays, and splatter.[7]

There is direct evidence which shows that airborne material within the dental surgery can be a risk for occupational asthma and ocular eye lesions among dental professionals. First report on the overall health status of Croatian dentists published in 2016 showed undesirable results and relatively high prevalence of occupational health problems.[8] It was found that over 78.18 % of the Croatian dentists experienced work-related pain in upper back, 76.97 % of them in lower back; work-related skin problems were reported by 29.29 % of dentists; sight and vision problems were reported by 46.87 % and hearing problems by 19.03 % of participants. The lack of information about work related occupational hazards among dental professionals prompted the present cross-sectional investigation with the aim to determine the use of P.P.E and the prevalence of upper and lower respiratory tract, eye, skin symptoms among dental professionals.

Materials And Methods

The study was a questionnaire-based survey conducted from May 2020 to July 2020, among the general and specialized dental professionals and dental hygienists practicing in Chandigarh city. Prior to start of study, a protocol and purpose of the present study was discussed with the participants and included those participants who are willing to participate in the study. A sample size comprised of 150 dental professionals (both males and females) which were selected randomly. Subjects with any medical history, were excluded from the study.

Questionnaires

A self-administered questionnaire, containing 25 questions was designed and framed based on the facts revealed in the previous researches on PPE. The first part consisting of questions on sociodemographic data related to age, gender, education level, and clinical/teaching experience. The second part of questionnaire consists of Personnel Protective Equipment (PPE items) related to face mask, face shield for eye protection, surgical gloves for hand protection, surgical gowns or surgical scrub for body protection and surgical head cap for head protection was get filled in by the participants. The third part of questionnaire consists of work related symptoms such as Upper and lower respiratory tract (cough and phlegm, shortness of breath, wheezing sound, chest tightness, sore throat and hoarseness of voice), skin (skin rashes and itching on skin) and eye symptoms (eye irritation and itching) were also filled in the form of multiple- choice responses. The scoring criteria of work-related symptoms were scored in two ways. Firstly, simply with the presence or absence of a reported symptom and secondly, with only

those symptoms which improved on days away from work (work related symptoms). Certain symptoms were combined with standard clinical practice and they were closely associated with work related symptoms. These combinations included allergic symptoms, which is suggestive of occupational asthma, symptoms possibly related to aerosols production. Symptoms suggestive of occupational asthma were shortness of breath, chest tightness, and wheeze (with improvement on rest days), and symptoms possibly related to aerosols included blocked or stuffy nose, dry throat, sore throat, and hoarse voice. Other symptoms included skin rashes or itchy or dry skin as well as itching and irritation in the eyes. All data were analyzed by multiple logistic regression analysis using SPSS software, version 20 ($\alpha = 0.05$).

Results

Out of 150 dental professionals a total of 114 responded positively by participating in this study. In this way the response rate was 76%. Rest of the dental professionals didn't complete the questionnaire and incomplete data were excluded from the survey.

Socio-demographic factors

The demographic details of the study participants are presented in Table 1, among which approx. half of the dental professionals were females 60 (52.6%) and males were 54(47.3%). Majority of dental professionals 81 (71.0%) has <5 years teaching experience and clinical experience. The age of dental professionals ranged from 25 to 55 years. A maximum number of respondents were in the age group of 25-35 years (61.4 %, 70). Demographic analysis based on the qualification, the number of dentists with a post graduate (MDS) qualification were 50 (44.8 %), with undergraduate qualification (BDS) were 45(39.4 %) & dental hygienist (DH) were 19(16.6%).

Table 1: Socio-demographic factors of dental professionals considered in the study

Socio-demographic factors		Dentists (n)	n (%)
Age	25-35 yrs.	70	61.4%
	36-45 yrs.	28	24.5%
	> 45 yrs.	16	14.0%
Gender	Male	54	47.3%
	Female	60	52.6%
Qualification	BDS	45	39.4%
	MDS	50	44.8%
	Dental Hygienists	19	16.6%
Clinical/Teaching Experience	< 5 yrs.	81	71.0%
	5-10 yrs.	19	16.6%
	10-15 yrs.	9	7.8%
	> 15 yrs.	5	4.3%

Awareness about the usage of personal protective equipment while doing hazardous dental procedures

When asked about the use of PPE, majority of dental professionals have an excellent experience while doing any dental procedure or surgery. dentist awareness about using PPE according to hazardous dental work are shown in table 2. The use of face mask or face shield becomes absolutely essential. In the current study, 77 (68.1 %) dental professionals always wear face mask throughout their clinical hours. N-95 and 3 layered masks are frequently used by dental professionals. 60.2% dental professionals always use the glasses or face shield while doing ultrasonic scaling or using air rotor handpiece to protect the eyes from any injury or splash or aerosols. Surgical gloves/ examination gloves are one of the important PPE tools for any dental or surgical procedures and 68.1% dental professional always uses gloves for hand protection. Surgical gowns/ surgical scrub suit/ surgical aprons are essential part of PPE kit. In this study

55(48.7%) dental professionals always uses the surgical scrub or surgical gowns in order to protect themselves. Similarly, 60(53.1%) dental professionals always uses surgical head cap and being an essential part of PPE kit, it is used by majority of dental professionals.

Table 2: dentist awareness about using personal protective equipment (PPE) according to hazardous dental work

Questionnaire	Dentists	n%
1. Please select the appropriate nose and mouth protection used during the procedures.	40	35.4
a. 3-layered mask	13	11.5
b. 2- layered mask	47	41.6
c. N-95 mask	2	1.8
d. Surgical green cloth mask (Autoclavable)	11	9.7
e. Disposable face mask		
2. Indicate which of the following statements most closely describes the present use of a face mask while ultrasonic scalers or hand instruments or any type of air rotor are being used.		
a. Always		
b. 75-99%	77	68.1
c. 25-49%	20	17.7
d. 1-24%	11	9.7
e. Never	5	4.4
3. Indicate which of the following statements most closely describes the present use of glasses or face shield for eye protection while ultrasonic scalers or hand instruments or any type of air rotor are being used.	0	0
a. Always		
b. 75-99%	68	60.2
c. 25-49%	29	25.7
d. 1-24%	10	8.8
e. Never	5	4.4
4. Indicate which of the following statements most closely describes the present use of Examination gloves/ surgical gloves/both for hand protection while ultrasonic scalers or hand instruments or any type of air rotor are being used.	1	0.99
a. Always	77	68.1
b. 75-99%	23	20.4
c. 25-49%	7	6.2

d. 1-24%	5	4.4
e. Never	1	0.9
5. Indicate which of the following statements most closely describes the present use of surgical gowns/ surgical scrub suit/ surgical aprons for body protection while ultrasonic scalers or hand instruments or any type of air rotor are being used.		
a. Always	55	48.7
b. 75-99%	36	31.9
c. 25-49%	13	11.5
d. 1-24%	9	8
e. Never	0	0
6. Indicate which of the following statements most closely describes the present use of surgical head cap/ Disposable head cap for head protection while ultrasonic scalers or hand instruments or any type of air rotor are being used.		
a. Always	60	53.1
b. 75-99%	34	30.1
c. 25-49%	12	10.6
d. 1-24%	7	6.2
e. Never	0	0

Work related symptoms (respiratory and allergic symptoms)

The prevalence of work-related symptoms such as persistent cough, productive cough, blocked or stuffy nose (possibly related to aerosols), runny nose or sneezing, eye irritation or watering (allergic symptoms), and skin rashes or itchy or dry skin were significantly more prevalent among dental professionals and dental hygienists. The prevalence of respiratory problems and allergic symptoms are shown in Table 3 and Table 4 respectively. Cough and breath shortness are mostly seen symptoms among dental professionals. 9.7% of the dental professionals stated that they had complaints of cough and phlegm, 88.5% had breath shortness, 12.4% had wheezing complaints, 14.2% had sore throat and hoarseness of voice and 28.3% had blocked or runny nose and sneezing. Cough complaints of the dental professionals generally occur in the night during winters and often last long. Even more significant symptom in terms of shortness of breath and sore throat along with hoarseness of voice and exposure rate was found to be 25% and 27.5% respectively. Another important finding is that 64.6% of those who had respiratory complaints stated that their respiratory symptoms tended to decrease during the time period they are away from work (e.g., weekends). 19.6% dental professionals complain of blocked or running nose and sneezing and the reason may be because of latex allergy from gloves.

25.7% dental professionals complain of allergic symptoms such as eye irritation or watering and skin rashes or itching. 68.2% dental professionals responded that allergic symptoms are better while they are away from work.

Latex gloves are the main common reason in between blocked or runny nose and eye irritation an it may be the allergic component to the sensory organs. Even 27.1% dental professional also responded about the allergy conditions while using ultrasonic scaler or air rotor. (Table 4)

Table 3 Prevalence (% of respiratory problems associated with dental work reported by dental professionals)

Questionnaire	Dentists	n%
1. Indicate whether you have any complain of cough and phlegm after wake up in the morning.	11	9.7
a. Yes	102	90.3
b. No		
2. If “yes” Is your cough and phlegm better on holidays or when you are away from work.		
a. Yes	13	48
b. No	12	52
3. When did you first start your cough and phlegm?		
a. During the day in the winter	3	8.6
b. During night in the winter	6	17.1
c. During the day in the summer	3	8.6
d. During the day in the summer	1	2.9
e. Not applicable	2	62.9
4. Indicate whether you have any complain of shortness of breath when walking or when you are at ground level.		
a. Yes		
b. No	100	88.5
5. If “yes” Is your breathlessness better on holidays or when you are away from work.	13	11.5
a. Yes		
b. No	13	46.4
6. When did you first experience your breathlessness?	15	53.6
a. While walking		
b. When you are at ground level		
c. While doing dental or surgical procedures	2	5.6
d. During routine activities	0	0
e. Not applicable	9	25
7. Indicate whether you have any complain of Wheezing sound along with chest tightness during shortness of breath.	3	8.3
a. Yes	22	61.1
b. No		

8. If “yes” Is your Wheezing sound along with chest tightness better on holidays or when you are away from work.	14	12.4
a. Yes	99	87.6
b. No		
9. When did you first experience your Wheezing sound along with chest tightness?	13	43.3
a. While walking	17	56.7
b. When you are at ground level	2	5.6
c. While doing dental or surgical procedures	3	3
d. During routine activities	8	22.2
e. Not applicable	3	8.3
10. Indicate whether you have any complain of Sore throat and Hoarseness of voice.	20	55.6
a. Yes	16	14.2
b. No	97	85.8
11. If “yes” Is your Sore throat and Hoarseness of voice better on holidays or when you are away from work.		
a. Yes	16	51.6
b. No	15	48.4
12. When did you first experience your Sore throat and Hoarseness of voice?		
a. While walking	2	5
b. When you are at ground level	2	5
c. While doing dental or surgical procedures	11	27.5
d. During routine activities	3	7.5
e. Not applicable	22	55
13. Indicate whether you have any complain of Blocked or runny nose and sneezing.		
a. Yes	32	28.3
b. No	81	71.7
14. If “yes” Is your Blocked or runny nose and sneezing better on holidays or when you are away from work.	31	64.6
a. Yes	17	35.4
b. No		
15. When did you first experience your Blocked or runny nose and sneezing?		
a. When you are using latex gloves	11	19.6
b. While doing dental or surgical procedures	9	16.1
c. During routine activities	1	1.8
d. During seasonal change	15	26.8
e. Not applicable	35.7	35.7

Table 4: Prevalence of allergic symptoms associated with dental work reported by dental professionals (skin allergy and eye irritation)

questionnaire	Dentists	n%
1. Indicate whether you have any complain of Eye irritation and rashes and itching on skin.		
a. Yes	29	25.7
b. No	84	74.3
2. If “yes” Is your Eye irritation and rashes and itching on skin better on holidays or when you are away from work.	30	68.2
a. Yes	14	31.8
b. No		
3. When did you first experience your Eye irritation and rashes and itching on skin?	9	18.8
a. When you are using latex gloves	13	27.1
b. When you are using ultrasonic scalers or air rotor	4	8.3
c. While doing dental or surgical procedures	3	6.3
d. During routine activities	19	39.6
e. Not applicable		

Discussion

This is the study to investigate the use of P.P.E along the prevalence of upper and lower respiratory tract infection, eye irritation and skin symptoms among dental professionals. The findings of this study are consistent with those from other studies since a claim that dental health professionals are at high risk of occupational and work-related diseases is supported by evidence. The infection chain consists of a susceptible host, pathogen, and a portal of entry that is efficient. Effective infection control strategies are intended to break this chain of infection at any particular point. The PPE is also designed with this concept as the prime focus. The availability and suitability of different types of face masks and glasses that offer different levels of protection. Although all masks will act as a physical barrier to larger particles or droplets only some seem to be effective filters.[11,12] However, even these may not necessarily prevent inhalation of particles of respirable size which could pass around the edge where the glasses fit poorly. Similarly, various forms of eye shield have been advocated over the years, all of which reduce the hazard from large particles (ballistic splatter) but have variable effectiveness against an aerosol, depending on their closeness of fit.

In our study majority of the dental professionals are aware of using the PPE kit and have an excellent experience while doing dental or surgical procedure. The components of PPE are gloves (68.1%), gowns (48.7%), face shields (60.2%), hair protection (53.1%) and mouth masks (preferably N-95 41.6% and3-layered 35.4%). The primary aim of PPE is that it may acts as a barrier between infectious materials such as viral and bacterial contaminants and protect the skin, mouth, nose, or eyes (mucous membranes). The barrier has the potential to block transmission of contaminants from blood, body

fluids, or respiratory secretions. However, a study by Hwang found that although the rate of using protective gloves and masks was high, the rate of using safety goggles was inadequate. Wearing personal protective gear is important as the dental setting increases aerosol risks to the membranes of the eyes, nose, or lips.[13] Aerosols are difficult to identify with the naked eye, and there is a possibility of cross-contamination between patients and workers through invasive treatment. Supplementing policies relating to the use of personal protective equipment and continued education are needed.

Skin diseases and respiratory problems are the most common occupational diseases, in dental profession. In their everyday work, dental professionals use different chemicals, drugs and other irritants. Most work-related dermatoses (over 95 %) are subtypes of contact dermatitis. The main cause of contact dermatitis is skin contact with irritants and/or allergens.[9] Latex allergy has emerged as an important cause of allergic reactions, particularly in health care workers, dental hygienists, dental professionals and laboratory technicians. The manifestations of latex allergy include dermatological and respiratory symptoms and, in its most severe form, anaphylaxis. Dental personnel have a very high exposure to latex gloves as they may be gloved eight to 10 hours each working day.[10,11] The results of research of Kurpiewska et al. showed that midwives (67 %) and dentists (64 %) have the highest prevalence of occupational skin diseases among healthcare workers and that occupational skin diseases among dentists are (35 %) caused by gloves.[9] Prajapati et al. described a case of contact dermatitis due to methyl methacrylate in a dentist presented as itching and rashes of the contact areas.[12] Methyl methacrylate is used for fabrication of acrylic dentures for edentulous patients and has strong sensitizing properties. In this study, skin disorders are reported by 29.2 % dentists and latex allergy and contact dermatitis were identified as the main cause of skin disorders.

The risk of eye injury in dentistry is mostly attributed to the use of high-speed handpieces and ultrasonic devices. The common eye irritants can be mechanical, electrochemical, biological, or electromagnetic in nature. The eye injuries caused by these can range from mild irritation to total blindness.[14] The usage of goggles is advised to prevent any spill or splash or aerosol from contacting the eyes. In the current study more than half of dental professionals uses face shield in order to protect the eye injury from any trauma. When work related symptoms were assessed one third of dental professionals complains of respiratory infection, eye irritation and skin problems. The respiratory infection such as cough and phlegm (17.1%), shortness of breath (25%), wheezing sound (22.2%), sore throat and hoarseness of voice (27.5%) and blocked or running nose (16.1%).

As this cross-sectional study is questionnaire based, recall bias by the participants could be a limitation of the study; Thus, the use of PPE prevents the transmission of infection from the dentist to the patient and also from the patient to the dentist. Furthermore, the change of PPE between patients is a must as this avoids cross-infection.[15,16]

Conclusion

This study concludes that dental professionals are more prone to develop occupational and work-related diseases or disorders and can initiate a series of events that could result in a too early career ending. Respiratory infections, eye irritation and skin disorders are among most commonly reported health problems. The first and most important step in protecting against occupational diseases is to improve dental health professionals' awareness and understanding of occupational and work-related diseases.

Dental professionals need to recognize the significant impact of occupational diseases on health.

The best way to prevent occupational health injuries is to transform the working environment into one that causes no harm. However, changing the duties or hazardous factors involved in dental professional's work is difficult. Therefore, it is important to use personal protective equipment while working.

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