ORIGINAL ARTICLE

Aerosols exposure and respiratory morbidity among dental health care Professionals of Lucknow

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Abstract

Introduction: Dentists use high-energy equipment, such as drills and scalers in the presence of bodily fluids such as blood and saliva, and dental plaque. This combined effect generates aerosols of oral micro-organisms, and blood. **Objective**: To determine the prevalence of respiratory morbidities and practices for protection against aerosols exposure at work place among dental health care professionals in District Lucknow. **Methods**: This cross-sectional study involved private dental practitioners registered with Indian Dental Association chosen by Simple Random Sampling. Dentists who gave consent and who were practicing for at least 1 year were included. Aerosol exposure and respiratory morbidity was assessed using a self-administered questionnaire. SPSS software version 16.0 was used for data analysis. **Results**: Total number of study participants were 0. Mean age in years of study subjects were 33.5 ±11.6. Their average years of involvement in clinical practice were 10.0 ±12.75. Majority of dental practitioners used hand scalers (70%) and power scalers (80%) on patients. A higher proportion changed their masks by the day (60%). Majority used protective eye goggles (70%). Only 30% used high efficiency particulate room filters while 20% used humidifiers and air purification systems. One fifth of respondents usually had cough. **Conclusion**: Respiratory morbidity is associated with workplace generated aerosol among dental health professionals. Awareness regarding occupational exposure and implementation of preventive strategies is required to provide a safe working environment.

Keywords:

Aerosols, respiratory morbidities, dental professionals.

Introduction

Exposure to hazardous materials at the workplace is a frequent cause of occupational lung disease. (1) Dentists use high-energy equipment, such as drills and scalers, in the existence of bodily liquids such as saliva, dental plaque and blood. This combined effect have been found to generate aerosols of oral micro-organisms, and blood.(2) Substances such as silica, heavy metals, beryllium and cobalt, used throughout grinding, polishing and sandblasting of metal alloys, resins and ceramics may also contribute to pneumoconiosis.(3) Pneumoconiosis among dental technicians is reported ranging from 4.5−38.6%.(4-7) Some earlier studies have shown greater prevalence of respiratory diseases among dentists.(8,9) When deficient workplace airing and the lack of preventive measures are added to this exposure, the risks become much larger.(10) Bio aerosols composed of relatively modest particle size that can lead to increased risk of infection.(11) Masks \orking atmosphere. There is shortage of literature on respiratory morbidity connected with workplace generated aerosol amongst dental health professionals in India. Therefore, this study was planned to determine the prevalence of respiratory morbidities and practices for protection against aerosols exposure at workplace among dental health care professionals in District Lucknow.

Aims & Objectives

To determine the prevalence of respiratory morbidities and practices for protection against aerosols exposure at workplace among dental health care professionals in District Lucknow.

Material & Methods

Study type: Cross-sectional study

Study population: Involved private dental health care professionals registered with Indian Dental Association in District Lucknow

Study area: This study was conducted in Lucknow district of India.

Study duration: The period of study was three months from June 2018- August 2018, which was used for the development of study tools, collection of data, analysis and presentation of findings.

Strategy for collection: Aerosol exposure and respiratory morbidity was assessed using a self-administered pretested questionnaire having closed ended questions from dental health care professionals of District Lucknow chosen by Simple Random Sampling.

Inclusion Criteria: Dental health care professionals who were practicing for at least 1 year

Exclusion Criteria: Any diagnosed chronic respiratory disease prior to dental practice.

Ethical consideration: The study was approved by the Institutional Research Committee (IRC) & the Institutional Ethics Committee (ERC).

Consent: Prior written consent was obtained from Dental Health Care Professionals participating in the study as study subjects.

Sample size: The minimum sample size as per central limit theorem was 30. (13)

Data analysis: By using the Microsoft Excel & SPSS windows version 16.0 software.

Results

Total 30 study subjects were included in which 18 (60%) and 12 (40%) were male and female respectively. Mean age in years of study subjects was 33.5 ±11.6. Their average years of involvement in clinical practice were 10.0 ±12.75 and they spend average time in hours during their clinical practice per week was37.8 ±10.78. Seventy percent of study subjects who had no family history of chronic lung disease. (Table 1)

(Figure 1 illustrates the distribution of respiratory symptom/ behaviour among study participants A higher proportion of respondents were having cough, high blood pressure and breathlessness (20 percent each). Out of total only 10 percent of study participants had behaviour of first hand smoke and passive smoking. Ten percent of study subjects were suffering with chest cold or chest illnesses.

(Figure 2) shows that a higher proportion of respondents changed their masks by the day (60%) followed by change of masks between patients (40%).

Above (Table 2) depicts that majority of dental practitioners used hand scalers (70%) and ultrasonic scalers (80%) on patients. Majority used a protective eye goggle (70%). Only 30% used high efficiency particulate room filters.

Discussion

Dentist's workplace leads to numerous risks to its workers. A study found that one half of the public health dentists stated occupational health complaints such as dermatoses (40%), eye, respiratory and systemic complaints (13%), and musculoskeletal problems (3%).13 Another study

observed over 40% of dental professionals influenced with hand dermatoses and irritations to eyes, nose, and airway at some point in their career, and women dentists experienced double the chances of allergy occurrence.(14) This study was conducted among 30 dental health professionals of Lucknow. A higher proportion of respondents were males (60%). Similar study was conducted by Althomairy et al (15) that involved most of the male dental health professionals (67.3%). In this study the number of practice hours per day ranged from one to thirteen hours among the practitioners. Majority (57.2%) of practicing dentists in Chennai practiced around six days in a week.(16) This workload may contribute to an increase in the risk of dental staff and patient exposure to aerosolized microbial pathogens in general dental office. Present study reported that cough, high blood pressure and breathlessness was present among 20 percent respondents while 10 percent of the respondents had a history of current and passive smoking. Ten percent of study subjects were suffering with Chest cold or chest illnesses. This can be attributed to workplace generated aerosol causing symptoms of respiratory morbidity amongst these dental health professionals. Majority of the dental practitioners used hand scalers (70%) and ultrasonic scalers (80%) on patients in our study. Most dental procedures that use mechanical instrumentation produce airborne particles from the site where the instrument is used. Dental handpieces, ultrasonic scalers, air polisher sand air abrasion units produce the most visible aerosols. Each of these instruments removes material from the operative site that becomes aerosolized by the action of the rotary instrument, ultrasonic vibrations or the combined action of water sprays and compressed air. The water spray usually is the portion of the aerosol that is most visible to the naked eye and is noticed by the patient and dental personnel. A study also observed that when an ultrasonic scaler was used in vitro without any coolant water, there still was a large amount of aerosol and splatter formed from small amounts of liquid placed at the operative site to simulate blood and saliva.(17) This airborne material was spread for a distance of at least 18 inches from the operative site. Despite the amount of splatter and the distance it was spread, no visible aerosol was detected during the use of the ultrasonic scaler, and it could only be detected as settled droplets on the environmental surfaces.(18) In present study, majority of dental practitioners were changing their mask on every patient i.e., 60%. On the other hand, 40% dental practitioners were using a mask for the whole day. The use of personal barrier protection such as masks, gloves and eye protection eliminate much of the danger inherent in splatter droplets arising from the operative site.(19) Eighty percent of dentists were using preprocedural rinse with antiseptic mouth wash such as chlorhexidine in this study. It has been reported that Chemical approach includes the use of chemical disinfectants which have broad spectrum anti-microbial activity like chlorhexidine gluconate, povidine iodine, glutaraldehyde, ethanol, hypochlorite and peroxide.(20) Majority of dental professionals in present study used a protective eye goggle (70%). Other studies have reported that most of the clinicians follow all the protocols except the use of protective eye goggles while attending patients. Injury from splatters and projectiles including calculus and flying debris during cavity preparation is a common cause of damage to the eyes, and the use of protective eyewear should be emphasized.(21-23) Furthermore, traumatic injuries to the eye in prosthodontic practice are more common due to the usage of high speed rotating instruments which can generate projectiles up to 9 m/s which are often hot, sharp and infected. Symptoms include lacrimation, pain, conjunctivitis; corneal abrasion and blurring of the vision have been also reported.(24) More significant hazards are caused by laboratory materials. Painful reactions are elicited when methyl methacrylate monomer or pumice which includes lime and quartz are by mistake splashed into the eye; moreover, pumice can also induce abrasion.(25) Curing lights are commonly used for polymerization of restorative resin materials and produce forceful blue light of range of 400 nm to 500 nm wavelength. According to a report, the increased ocular risk occurred at about 440 nm.(26) All the dental professionals should change their gloves between patients due to hygiene purpose. Moreover, Althomairy et al (15) reported that the most positive attitude reported among dental health professionals was towards the use of protective barrier techniques (gloves, gowns, gloves, masks, and goggles) when dealing with MERS-CoV patients. This response was significantly associated with the category and qualification of DHPs. Dentists having master qualifications showed relatively higher positive attitude to this question compared to dental

auxiliaries. On contrary, reports have also suggested that the health-care worker's knowledge of newer infectious diseases was poor especially in use of personal protective measures, isolation, and infection control practices.(27) In present study only 30% dental professionals used high efficiency particulate room filters while only 20% used air purification systems. The use of a high-volume evacuator, has been shown to reduce the contamination arising from the operative site by more than 90 percent.(28-30) Also high vacuum suction/evacuator which is correctly positioned near the handpiece and close to the mouth can reduce 90% of aerosol production.(31,32) Majority of dental professionals did a preprocedural rinse with antiseptic mouth wash such as chlorhexidine in this study. In addition, Gupta et al demonstrated the efficacy of preprocedural rinsing in chlorhexidine in reducing the aerosol contamination produced by ultrasonic scaling .(33) The water line has to be flushed at the start of each clinical day and between patients, for 30 seconds to 1 minute to reduce microbial accumulation due to overnight waterline stagnation.(34) Surface contamination can be minimized by thin plastic bags, wraps or aluminium foils. These types of obstructions can be located on surfaces like dental unit light handles, mechanical and electrical checks, head and arm rest, dental unit controls and high and decelerate speed handpiece, ultrasonic scaler, air/water syringe, saliva ejector and HVE hose. Periodic evaluation has to be done for a healthy dental environment.(35) Guida et al highlighted the need to improve disinfection procedures and air treatment system in dental environment. Microbiological monitoring could represent an important element to detect the presence of risk factors and to adopt control measures.(36) Larger multicentric study with quantitative estimation of aerosol presence in workplace setting is further required.

Conclusion

The findings of this study suggest that the respiratory morbidity is associated with workplace generated aerosol among dental health professionals.

Recommendation

Awareness regarding occupational exposure and implementation of preventive strategies is therefore the need of the hour to provide a safe working environment.

Limitation of the study

No quantitative estimation of aerosol presence in workplace setting.

Relevance of the study

There is a connection between aerosol exposure at workplace and respiratory morbidity among dental health professionals.

Authors Contribution

SEM: conceived the idea of this study, supervised the study, participated in the design of the research instrument, reviewed related literature, participated in discussing findings, made recommendations based on the findings of the study & finalized the manuscript for submission. **AA:** participated in design of the work, analysis of the data & interpretation of the results. He is also actively participated in the write-up of the study. **NA:** participated in design of the work. **MC & SS:** participated in data collection and involved in management of the study subjects. **KM:** along with other authors read and approved the final manuscript.

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Tables

TABLE 1 DEMOGRAPHIC AND CLINICAL PROFILE OF DENTAL PRACTITIONERS

Variable	Number	Percentage
Gender		
Male	18	60.0
Female	12	40.0
Age group(years)		
≤35	24	80.0
>35	06	20.0
Family history of chronic lung disease		
Yes	09	30.0
No	21	70.0
Pursuing clinical practice(years)		
<10	21	70.0
≥10	09	30.0
Clinical practice per week (hours)		
≤40	15	50.0
>40	15	50.0

TABLE 2 PRACTICES OF DENTAL HEALTH CARE PROFESSIONALS FOR PROTECTION AGAINST AEROSOLS EXPOSURE AT WORKPLACE

Practices	n (%)
Use only handscalers on patients	21 (70)
Use ultrasonic scalers on patients	24 (80)
Use high volume evacuation suction tip	24 (80)
Do a preprocedural rinse with antiseptic mouth wash such as chlorhexidine	24 (80)
Use a protective eye goggle	21 (70)
Use gloves routinely	27 (90)
Wash hands before gloving	21 (70)
Change gloves between patients	30 (100)
Wash hands with bactericidal soaps	27 (90)
Use high efficiency particulate air room filters	09 (30)
Use any air purification systems	09(30)
Use ultraviolet treatment of ventilations system	03(10)
Use high speed hand pieces, air turbines and three in one syringes	27(90)

Figures

FIGURE 1 PERCENT DISTRIBUTION OF RESPIRATORY SYMPTOMS/BEHAVIORS AMONG THE RESPONDENTS

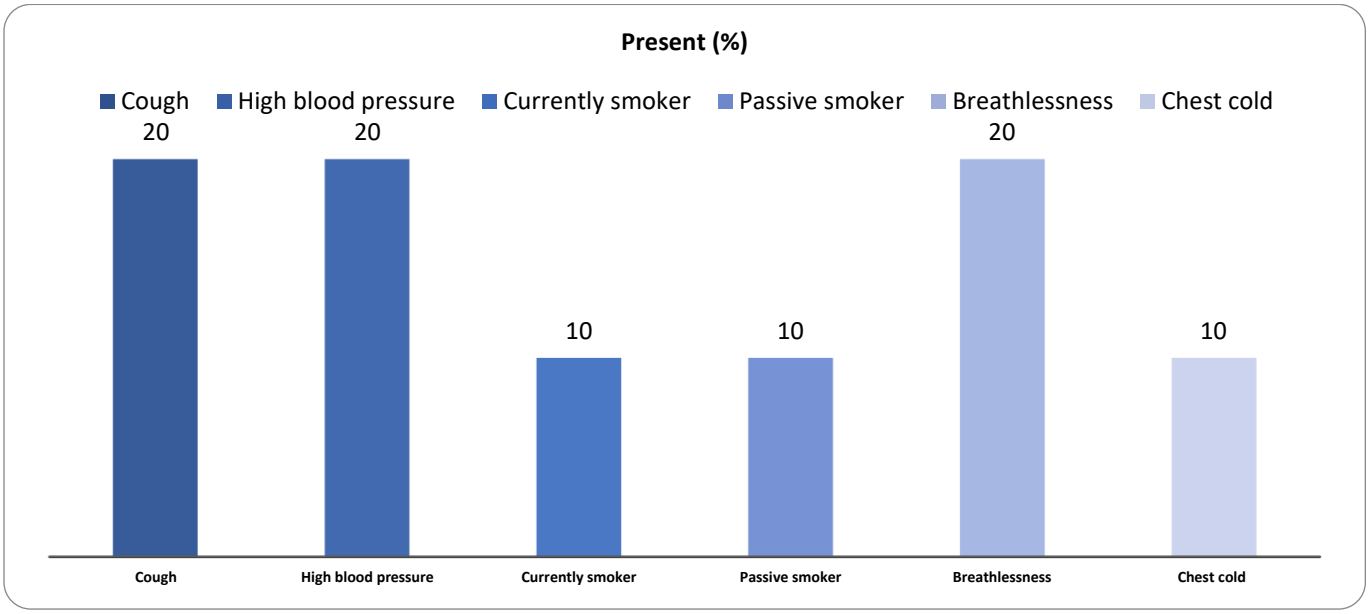

FIGURE 2 FREQUENCY OF CHANGE OF MASK IN THE CLINIC BY DENTAL PRACTITIONERS