



HEALTH HAZARDS IN THE WORKPLACE RELATED TO DENTAL TECHNICIANS IN LAHORE

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Abstract

Professionals in the dental industry, including dentists, assistants, hygienists, and technicians, face various occupational hazards. These dangers range from coming into contact with dangerous substances and infectious agents to dealing with pollutants. They also face risks associated with maintaining awkward positions for extended periods, which can lead to musculoskeletal problems, as well as the potential for work-related stress and its associated health complications. The purpose of the study was to explore workplace health risks among dental technicians in Lahore. For this observational study with a descriptive design, a non-probability purposive sampling technique was employed to select 88 dental technicians from both educational hospital labs and private dental labs in Lahore. They were surveyed directly within their working environments. They were surveyed directly within their working environments. To analyze the collected data, the study utilized the statistical software SPSS, version 22. Calculations were made of percentages, mean, and standard deviation. The average age of the eighty-eight dental technicians was 30.17 ± 10.52 years and had 7.057 ± 3.54 years of average experience. Although the working environment in both types of laboratories was excellent, only one-fourth of the participants had their immunization (hepatitis B vaccination) and the recommended safety precautions and infection control measures were not followed. Stress-inducing factors (96.6%), hand and neck musculoskeletal issues (71.6%), and skin reactions (64.8%) were the most frequently reported occupation issues. The most frequent workplace hazard was identified as stress, with time-related pressure (77.3%), high concentration levels (54.5%), and heavy caseloads as contributory causes (50%). This research identified some of the most important occupational risks for dental technicians, such as working long hours, inadequate ventilation, poor infection control, and lack of proper PPE use. These risks were strongly related to stress at work, musculoskeletal complaints, skin responses, and respiratory symptoms, pointing towards the necessity for better workplace safety standards.

Keywords

Dental technicians, dental labs, occupational risks, work-related health problems, health risks, professional hazards.



1. Introduction

Each occupation has its own unique set of dangers and risks. In the case of dental procedures, there is no exception. There is a lot of professional risk for dental technicians (Saadat, 2017). These risks, in addition to the typical stress-related dangers, include ergonomic, chemical, biological, a variety of working postures, and work-related threats (Hamida & Hedia, 2002). As a result, all laboratory personnel must be able to work in a secure environment. All employees need to be aware of the issues that could affect their health and safety at work, regardless of whether they are full-time, temporary, or permanent employees. Every employee has a right to work in a setting where risks to their health and safety are reasonably regulated, enabling them to take protective measures when dangers are identified. The workforce in dentistry is subject to a variety of work-related risks, including stress, anxiety, abnormally vulnerable responses, and high levels of stress, percutaneous injury, radiation risks, musculoskeletal illnesses, and legal threats (Hamida & Hedia, 2002) (Saadat, 2017). The oral environment exposes people to a lot of microbes. Systemic contamination can be brought on by invasive bacteria that are discovered in blood or saliva as a result of bacteremia or viremia (Milam & Giovannitti, 1984) (Farrier *et al.*, 2006). Dental patients and staff are exposed to these bacteria through blood, oral fluids, and respiratory secretions. Patients and staff that work in dental offices are exposed to these bacteria through blood, oral fluids, and respiratory secretions. The organisms enter the body by a skin incision caused during a surgical procedure or dental procedure, either through an inadvertent biting or masticating

pressure from the patient or through a needle puncture created during anesthetic administration (Morgenroth *et al.*, 1985). Numerous factors were cited as causes, including the prevalence of numerous illnesses, elevated rates of percutaneous presentations, infections, radiation, dangerous dental products, musculoskeletal issues, dermatitis, respiratory scattering, eye wounds, environmental pollution, and mental health problems among dental workers (Hamida & Hedia, 2002) (Saadat, 2017). When sharp, damaged instruments or a fast projectile are used to trim and polish dentures, percutaneous injury results in unintended skin wounds and abrasions. Through such trauma, diseases or dangerous substances can enter the body. Traumatic injuries to the eyes are common due to the use of high-speed rotating instruments that can produce particles moving at up to 9 m/s and typically being hot, sharp, and contagious. Conjunctivitis, discomfort, blurred vision, lacrimation, and corneal abrasion are a few symptoms (Christiansen *et al.*, 1986). Dental practitioners are exposed to respirable metal vapors and grinding dust during grinding and polishing cast dental restorations. Inhaling volatile chemicals like methyl methacrylate (MMA) can cause pathologic alterations in the central nervous system (Seppäläinen & Rajaniemi, 1984), lungs, and liver (De Vuyst *et al.*, 1986). Metal, resin, ceramic, and plaster grinding dust can induce silicosis, which is similar to lung cancer (Hjortsberg *et al.*, 1989) (Olsen, 2002). Furthermore, high-frequency vibration from headpieces may cause finger receptor dysfunction (Szymanska, 2000) or white fingers (Mojarad *et al.*, 2009) and continuous machine noise may impair hearing. In addition to organic risks and hazards, dental technicians faced musculoskeletal

diseases, including sciatica, lower back, neck (Fish & Morris-Allen, 1998), and shoulder discomfort, as well as neurological symptoms like tingling, paresthesia, and muscular weakness (Al Wassan *et al.*, 2001). Injuries to the musculoskeletal system's numerous structures are collectively referred to as musculoskeletal complaints. Pain, impairment, or discomfort in the joints, muscles, tendons, or other soft tissues are signs of a variety of musculoskeletal disorders (MSD). Dental technicians can prevent workplace hazards by integrating and putting into practice precautionary measures, as well as improving the working environment (Yamalik, 2007). Additionally, it is essential to continue dental training programs so that dental technicians can update their knowledge on the most latest and cutting-edge procedures and supplies (Jacobsen *et al.*, 1996) (Selden *et al.*, 1995) (Kronenberger *et al.*, 1990) (Choël *et al.*, 1999). This study's goal was to examine various workplace hazards associated with dental laboratories among dental technicians in the city of Lahore.

2. Materials and Methods

An observational descriptive cross-sectional study including 88 dental technicians was conducted in Lahore from January 2022 to August 2023, targeting dental technicians working in both private and teaching hospital laboratories. A total of 88 dental technicians were selected using a non-probability purposive sampling technique from the sixteen private dental laboratories and seven teaching hospitals' laboratories (Fatima Memorial Hospital, Akhtar Saeed Medical Hospital, Mansoorah Hospital, Children Hospital, Punjab Dental Hospital, Rashid Latif Medical Hospital, and Lahore Medical and Dental Hospital). Dental technicians who have

experience of at least one year, who are currently working in a dental laboratory in Lahore, and who would give informed consent were included in this study. Dental technicians having known pre-existing medical conditions (e.g., neurological conditions, respiratory diseases) might bias the findings. Technicians who cannot read or write or were not able to understand or fill out the questionnaire, based on language issues, were excluded from this study. With a margin of error of 10% and a confidence level of 90%, the sample size was calculated to be 88 the Hamida *et al.* revealed that the prevalence of the most common workplace risk among dental laboratory technicians in Alexandria city was 78.71% (Hamida & Hedia, 2002). Before data collection, ethical clearance was received from the Institutional Review Board (IBR) of FMH College of Medicine & Dentistry, Lahore. Informed written consent was obtained, i.e., voluntary participation, confidentiality, and the right to withdraw at any point. The conversation had also involved establishing a timeframe for data collection. Upon agreement of individuals to participate in this study, after the study details were explained. Data was collected through a structured self-administered questionnaire designed to gather information on sociodemographic characteristics, work environment, safety practices, and health-related complaints. Statistical Package for Social Sciences (SPSS) version 22 was used for data entry and analysis. For continuous variables, means and standard deviations were determined, whereas frequency and percentages were computed for categorical variables. The measured variables were graphically displayed using bar charts.

3. Operational Definitions

3.1 Reaction

A self-reported body response (e.g., irritation, discomfort, fatigue) to which the participant attributes exposure to occupational conditions, materials, or processes in the lab environment.

3.2 Systemic Reaction

A non-localized body response like chronic fatigue, overall weakness, or malaise not associated with any body part or organ and attributed by the participant to workplace exposure.

3.3 Finger Friction (Dermal Reaction)

Any symptom of the skin on fingers or hands, including peeling, redness, dryness, itching, or cracking, experienced by participants, and usually caused by contact with chemicals, dust, or not wearing protective gloves.

3.4 Respiratory Tract Reaction

Coughing, sneezing, sore throat, nasal congestion, or shortness of breath, as described by the participants, are believed to be caused by exposure to airborne particles, fumes, or inadequate ventilation in the laboratory.

3.5 Neurological and Vasomotor Response

Self-rated feelings of numbness, tingling, or coldness in the fingers (e.g., "white fingers") associated with extended use of vibrating tools or static postures during laboratory work.

3.6 Eye Response

Self-report irritation, redness, watering, or discomfort in the eyes, attributed to dust, chemical exposure, or inadequate eye protection.

3.7 Hearing Reaction

Belief of hearing-related problems, including ringing in the ears (tinnitus), feeling as if plugged up, or pain caused by repeated exposure to high levels of noise in dental labs.

4. Results

With a mean age of 30.65 ± 10.23 years, the staff comprised 88 dental technicians, 79.5% of whom were men. The mean work experience of the dental technicians in employment was calculated to be 7.06 ± 3.54 years (Table 1). The lowest experience was 1 year, and the highest was 15 years, indicating a mixture of junior and senior technicians.

Table 1: Social and demographic attributes of Dental Laboratory Technicians

Variable	Result	
Age (years)	Mean $\pm$ SD	30.65 ± 10.23
	Minimum	25 years
	Maximum	55 years
Years of Practice	Mean $\pm$ SD	7.06 ± 3.54
	Minimum	01 year
	Maximum	15 years
Gender	Male	70 (79.5%)
	Female	18 (20.5%)

Most of the technicians (58.0%) claimed to have both air conditioning and window ventilation in their labs, suggesting that there was sufficient airflow in the majority of working in cramped spaces, which

might pose ergonomic and respiratory hazards. The state of equipment and instruments was generally good, with 50.0% deeming them as good and 38.6% fair. 65.9% of laboratories were equipped with fire

pumps, while only 8.0% had warning alarms fitted. Interestingly, only 26.1% possessed both fire alarms and pumps, reflecting a wide emergency preparedness shortfall. While all the technicians (100.0%) employed face masks, 21.6% employed face shields, and 37.5% wore gloves, putting themselves at direct chemical and biological risks. A high percentage (94.3%) reported adequate lighting conditions, while 72.7% reported having spacious workspaces. Yet, 27.3% reported 42.0% of the participants. Hepatitis B vaccination coverage was

remarkably low at 21.6%, and a mere 35.2% reported appropriate handling of sharps or use of autoclaves. Hand hygiene practices were satisfactory, with 95.5% reporting the use of disinfectant soap, as demonstrated in Table 2. Generally, some rudimentary infection control practices were observed, yet the information revealed gross inadequacies in extensive protective measures and emergency preparedness. These gaps can themselves directly cause the high incidence of reported health complaints among the technicians.

Table 2: Workplace Environment, Safety Precautions, and Infection Control Measures among Dental Laboratory Technicians

Category	Option	Count (n)	Percentage (%)
Ventilation	Air Condition Only	9	10.2%
	Windows Only	28	31.8%
	Both	51	58.0%
Lighting	Good	83	94.3%
	Poor	5	5.7%
Space	Wide	64	72.7%
	Confined	24	27.3%
Instruments/Equipment Condition	Good	44	50.0%
	Fair	34	38.6%
	Poor	10	11.4%
Safety Precaution Measures	Fire Pump Only	58	65.9%
	Warning Alarm Only	7	8.0%
	Both the Fire Pump & Alarm	23	26.1%
Infection Control Measures	Face Mask	88	100.0%
	Face Shield	19	21.6%
	Gloves	33	37.5%
	Protective Glasses	37	42.0%
	Hepatitis B Vaccination	19	21.6%
	Hand Washing (Disinfectant)	84	95.5%
	Wearing a White Coat	43	48.9%
	Proper Handling of Sharps	31	35.2%
	Autoclave Use	31	35.2%
	Use of Dry Heat Oven	10	11.4%

According to the findings, the most prevalent work-related complaints were factors that cause stress (96.6%), musculoskeletal issues affecting the hands

and neck (71.6%), cutaneous reactions (64.8%), and systemic reactions (62.5%) (Table 3).

Table 3: Complaints Related to Workplace among Dental Laboratory Technicians

Nature of Complaints		Count	Percentage (%)
Systematic Reactions	No	33	37.5
	Yes	55	62.5
Musculoskeletal Problems In Hand And Neck	No	25	28.4
	Yes	63	71.6
Neurological And Vasomotor Fingers Reaction	No	58	65.9
	Yes	30	34.1
Respiratory Track Reactions	No	45	51.1
	Yes	43	48.9
Mucosal Reactions	No	57	64.8
	Yes	31	35.2
Eye Reactions	No	65	73.9
	Yes	23	26.1
Dermal Reactions	No	31	35.2
	Yes	57	64.8
Hearing Reactions	No	46	52.3
	Yes	42	47.7
Factors causing Stress / Stressor	No	3	3.4
	Yes	85	96.6

Factors causing stress, such as time-related pressure, high concentration levels, prolonged incorrect posture, and a heavy workload, were the most frequently reported work-related complaints (Table 4, Fig. 1). Musculoskeletal issues in the hand and neck was shown to be the second most common

work-related health hazard, including pain, rigidity, and restricted mobility in the muscle (Table 4 Fig. 2). The third most frequent workplace risk of cutaneous reactions (finger and nail borders) was determined to be desquamation, redness, and itching (Table 4, Fig. 3).

Table 4: Occupational Complaint Patterns, Risk Factors in the Workplace, Causes of Work-Related Issues

Complaints	Percentage (%)	Hazards	Percentage (%)	Contributing causes	Percentage (%)
Factors causing stress / stressor	96.6	Stress	96.6	- Time-related pressure - High concentration levels - High case load	77.3 54.5 50.0
Musculoskeletal problems in the hand and neck	71.6	Pain	63.6	Prolonged wrong posture and heavy workload	40.9
Dermal reactions (finger and nail borders)	64.8	Desquamation	51.1	MMA, ceramic, metallic processing	63.6
Systemic effects	62.5	Fatigue	50.0	Work load stress	46.6

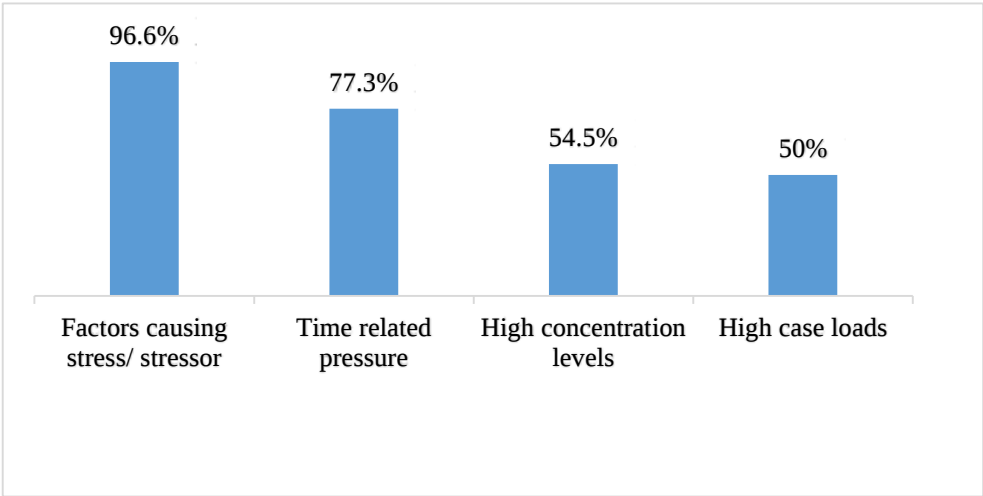


Figure 1: The most frequent health hazard, complaint, and contributing factors at work.

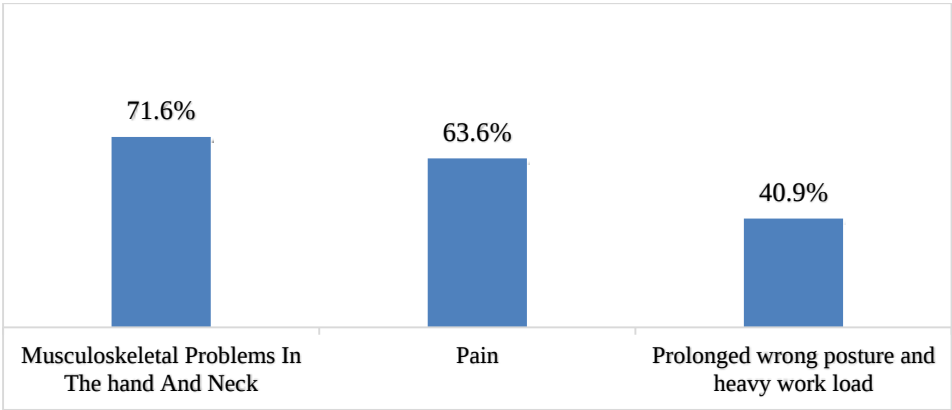


Figure 2: The second most common workplace-related complaint of musculoskeletal disorders, with contributing factors

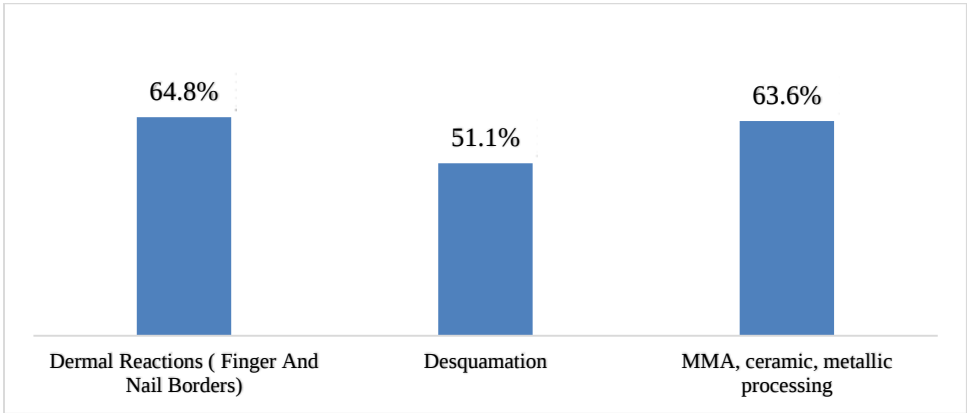


Figure 3: The Third most common workplace-related complaint of musculoskeletal disorders, with contributing factors. The study categorized participants into two groups: the "Exposed Group," consisting of dental technicians who did not adhere to safety practices such as wearing gloves or face shields, and the "Protected Group," comprising those who did follow these safety measures. The percentages presented

represent the proportion of technicians within each group who reported specific health issues.

Table 5: Associations Between Workplace Hazards and Health Problems

Workplace Hazard	Health Problem	Yes, in Exposed Group (%)	Yes, in Protected Group (%)	Chi-Square (χ^2)	p-value
No Glove Use (n = 55)	Dermal Reactions	85.5% (47/55)	30.3% (10/33)	28.91	< 0.001
Poor Ventilation (n = 37)	Respiratory Reactions	54.1% (20/37)	45.1% (23/51)	4.13	0.042
No Face Shield (n = 69)	Eye Irritation	26.1% (18/69)	26.3% (5/19)	1.28	0.257
No Safety Alarm (n = 65)	Stress Symptoms	98.5% (64/65)	91.3% (21/23)	5.76	0.016
No Hepatitis B Vaccine (n = 69)	Systemic Complaints	66.7% (46/69)	47.4% (9/19)	3.92	0.048

Notably, statistically significant associations ($p < 0.05$) were found, indicating a clear relationship between certain hazards and specific health outcomes. This suggests that the absence of safety In the literature concerning occupational health, dental technicians were frequently reported to face a variety of health issues attributed to their work environment. Therefore, the purpose of the current study was to explore the health problems as experienced by 88 dental laboratory workers in Lahore, where findings indicated that inadequate ventilation was a significant concern, with windows primarily serving as the fresh source. This limitation highlighted the critical need for hygiene, well-lit, and ventilated laboratory conditions, as such environments are fundamental for minimizing health risks. Improving laboratory conditions is essential; it can be achieved by upgrading equipment and instituting local exhaust ventilation systems. These measures would significantly mitigate exposure to harmful airborne substances and particulates, thereby enhancing occupational safety and health. (Saadat, 2017). The data also revealed that while

practices is linked to a higher incidence of health problems among dental technicians, as shown in Table 5.

5. Discussion:

most dental laboratories (65.9%) had emergency safety equipment (fire pumps), very few laboratories had warning alarms in place (8%). However, there were significant differences in the labs' safety and ergonomic setups. Dental laboratory technician lacked the basic infection control precautions necessary to reduce workplace risks and injuries, such as the usage of face shields, protective eyewear, and vaccines. None of the technicians used disinfection soap when washing their hands; instead, they all used tap water. When asked about their working environment, 27.7% of participants said that the dental laboratory was a cramped room. Just the confinement of the area itself poses numerous physical and psychological risks, including the improper handling of potentially dangerous materials and technicians' exposure to dangerous chemicals and contaminated human tissue. Other research carried out in India, the USA, Canada, and

the UK has reported similar conclusions (Choël *et al.*, 1999) (Yamalík, 2007) (Jacobsen *et al.*, 1996) (Gopinadh *et al.*, 2013). Regarding the impact of experience and age on the occurrence of health issues at work. The average age of the participating dental technicians was over thirty years old, and they had been employed for more than seven years. This is consistent with a research by Jacobsen and Pettersen from (Jacobsen *et al.*, 1996) years ago that discovered technicians older than 30 years old exhibited self-reported health issues. The finding that 54.19 percent of the youngest technicians (mean age 33.89 and 12.708 years of practice) had lung and respiratory tract reactions may be related to the dental technicians' exposure to various occupational dusts and chemicals (Selden *et al.*, 1995). Our findings confirmed those of Kronenberger *et al.* (Kronenberger *et al.*, 1990) and Chol *et al.* (Choël *et al.*, 1999) study, both of which indicated a strong connection between the period of working and the typical pulmonary complains symptoms. Dental professionals deal with a range of patients, some of whom carry various infections, hence infectious disorders are also fairly common among them. In our research, we discovered that more than half of the dental technicians lacked a Hepatitis B vaccination. Due to the high prevalence of diseases in our community, this is a serious situation. Dental technicians in Lahore had much more systemic reactions, particularly fatigue, although headache levels were also significantly greater than described in other studies (Saadat, 2017). According to technicians, the equipment conditions were generally in good condition. But in Lahore's private dental laboratories as well as dental labs at teaching hospitals, the availability of safety measures like fire

extinguishers and emergency escape indicators was surprisingly infrequent. In the case of an emergency, there is a significant risk to the health and safety of dental professionals (including dentists and dental technicians) and patients.

6 Conclusion

The most frequently identified hazards were long working hours, inadequate ventilation, no proper infection control, improper use of personal protective equipment (PPE) like gloves and face shields, and lack of hepatitis B vaccination. These hazards were strongly related to some health issues, such as high levels of work-related stress (96.6%), musculoskeletal disorders (71.6%), skin reaction (64.8%), and respiratory reaction (48.9).

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