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Study on the Prevalence, Awareness, Preventive Measures of Occupational Hazards Among Dental Students

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Abstract: Introduction: Dental professionals face unique challenges, including stress, exposure to hazardous substances, and potential infections. Understanding these hazards is crucial for enhancing safety measures in dental education.

Aim: This study explores occupational hazards among dental students, emphasizing psychological, physical, chemical, and biological risks.

Materials and methods: conducted at a private dental college in Chennai, the cross-sectional study involved 109 dental students. A structured questionnaire, approved by the institutional review board, collected data on demographics, occupational hazards, and safety practices, statistical analysis employed vassarstats and psp.

Results: participants (82.6% female, mean age 22.4) identified psychological hazards (46.8%) and inadequate lighting (44%) as common concerns. Mercury toxicity (44%) and aerosol infection (40.4%) were notable chemical and biological hazards.

Conclusion: the study illuminates diverse occupational hazards in dental education, advocating for targeted interventions to address psychological stressors, enhance preventive measures, and promote awareness, fostering safer learning environments for dental students.

Keywords: occupational hazards, dental students, psychological stress, preventive measures, safety practices.

I. INTRODUCTION

Dentistry is a noble profession dedicated to oral health, but it comes with its share of occupational hazards. Occupational hazards are risks or dangers that arise as a result of the nature or working conditions of a specific employment^[1] dentists are exposed to a variety of occupational dangers while doing their professional duties including: working long hours with a high level of focus, working in a sedentary manner, working with nervous patients, exposure to microbial aerosols produced by high-speed rotating hand pieces, exposure to various chemicals used in professional dental practise, and other risks. These hazards can pose serious risks to dental practitioners^[2]. These trigger the emergence of various kinds of occupational disorders, which grow and worsen with time. In many situations, they cause diseases and disease complexes, some of which are classified as occupational illnesses^[3].

Musculoskeletal injuries are the most commonly reported and experienced by dental professionals^[4]. this occupation requires the clinical dentistry practitioner to work in identical position and posture for long periods of time, resulting in neck stiffness or neck soreness, wrist ache, and lower backache^[5]. furthermore, because they come into direct or indirect touch with surgical tissues, blood, and saliva on a daily basis, the dental staff and auxiliary personnel are at risk of infection^{[6][7]}. needleprick injuries or wounds from sharp objects and equipment (percutaneous injuries) have been reported to occur in about 1%-15% of surgical procedures, with suturing being the most common cause^[8]. Eye injuries may occur as a result of protruding small fragments of calculus or splatter from body fluids during scaling or polishing treatments, as well as while utilising high-speed handpieces. The penetrating dental curing light is another possible source of eye damage^{[9][10]}. according to prior study, transitory exposure to irritants linked with volatiles from resin-based products, x-ray chemicals, and cleansers may produce certain reactions in the eyes and upper respiratory system. Other strong disinfectants that may irritate or injure the eyes and upper airway include procaine, eugenol, iodine, formalin, phenol, and others^[11].

This survey article provides an in-depth analysis of the multifaceted risks that dental professionals encounter in their daily practice. From exposure to infectious diseases like HIV and hepatitis to ergonomic challenges leading to musculoskeletal disorders, this article explores the gamut of hazards affecting dental practitioners. We also examine the measures and protocols in place to minimise these risks, such as infection control procedures, ergonomic improvements, and the use of personal protective equipment.

By shedding light on these occupational hazards and their management, this survey aims to raise awareness and promote a safer working environment for dentists and their support staff. The findings from this survey will contribute to a better understanding of the challenges faced by dental students in their workplace. It will help dental associations, healthcare organisations, and policymakers implement targeted measures to reduce occupational hazards, enhance the well-being of dental practitioners, and improve patient care.

II. MATERIALS AND METHODS

This study utilized a cross-sectional research design to evaluate occupational hazards in the workplace of dental students. The research, titled "how safe is your workplace? Exploring occupational hazards survey among dental students," was conducted at a private dental college in Chennai, involving participants from different academic years. A structured questionnaire was devised to collect information on occupational hazards in dentistry, safety measures, and demographic details of the participants. Ethical clearance for the research was obtained from the institutional review board (irb), and all participants provided informed consent, signifying their voluntary participation in the study. Throughout the research, strict measures were implemented to maintain participant anonymity and ensure the confidentiality of collected data, with no personally identifiable information recorded. The questionnaire was distributed via google forms across various social media platforms to gather responses. A total of 109 dental students actively took part in the study. The data collected from the questionnaires were transferred to excel and subsequently analyzed using vassarstats and pspp for statistical purposes.

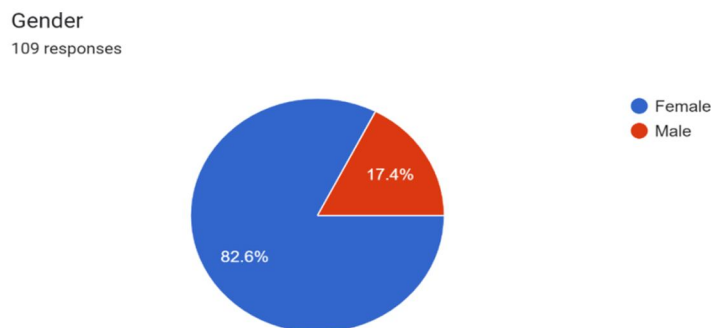
A. Statistical Analysis

The data obtained through google forms were transferred into excel format and its analysis was done using vassarstats and pspp. Descriptive statistics including frequency and percentages were calculated for all the responses given by the participants. Statistical significance was assessed using pearson’s chi-square test. The statistical significance in the present study was kept at $p < 0.05$.

Table 1 distribution of participants based on gender

Gender	Frequency	Percentage
Males	19	17.4
Females	90	82.6

Fig 1: percentage distribution of participants based on gender



B. Distribution of Study Results of the Questionnaire Among the Study Population

1) Most common occupational hazards?

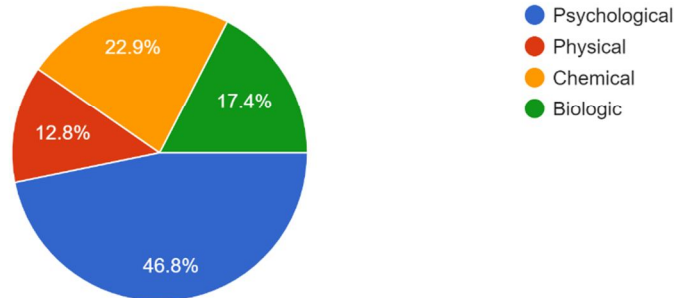
Table 2: distribution of response to question 1

Question	Options	[n]	[%]	Chi-square	P-value	Significance
Most common occupational hazards?	Psychological	51	46.8	9.29	0.0256	Significant at $p < .05$
	Physical	14	12.8			
	Chemical	25	22.9			
	Biologic	19	17.4			

Fig 2: pie chart representation of percentage distribution of response to question 1

Most common occupational hazards?

109 responses



2) Most common psychological hazards of dentistry?

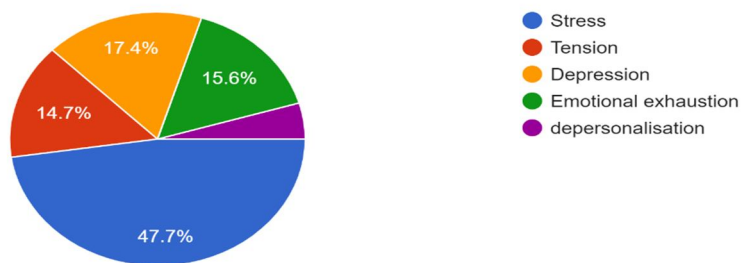
Table 3: distribution of response to question 2

Question	Options	[n]	[%]	Chi-square	P-value	Significance
Most common psychological hazards of dentistry?	Stress	52	47.7	9.23	0.0264	Significant at p < .05
	Tension	16	14.7			
	Depression	19	17.4			
	Emotional exhaustion	17	15.6			
	Depersonalisation	5	4.6			

Fig 3: pie chart representation of percentage distribution of response to question 2

Most common psychological hazards of dentistry ?

109 responses



3) What is your Reason for your psychological hazards?

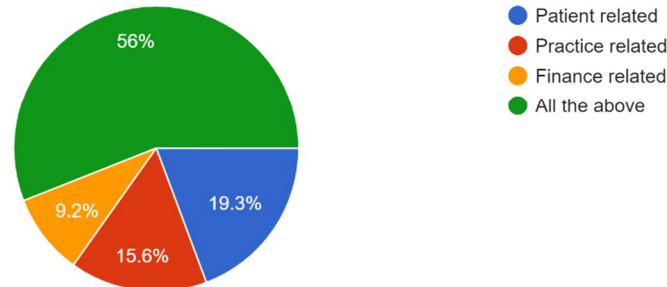
Table 4: distribution of response to question 3

Question	Options	[n]	[%]	Chi-square	P-value	Significance
What is your Reason for your psychological hazards?	Patient related	21	19.3	24.54	.000019	significant at p < .05
	Practice related	17	15.6			
	Finance related	10	9.2			
	All the above	61	56			

Fig 4: pie chart representation of percentage distribution of response to question 3

What is your Reason for your psychological hazards?

109 responses



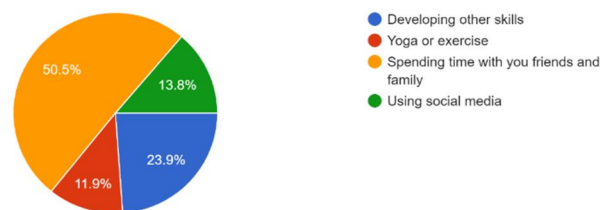
4) How do you overcome these problems?

Table 5: distribution of response to question 4

Question	Options	[n]	[%]	Chi-square	P-value	Significance
How do you overcome these problems?	Developing other skills	13	23.9	21.76	0.0001	significant at p < .05
	Yoga or exercise	26	11.9			
	Spending time with you friends and family	13	50.5			
	Using social media	55	13.8			

Fig 5: pie chart representation of percentage distribution of response to question 4

How do you overcome these problems?
109 responses



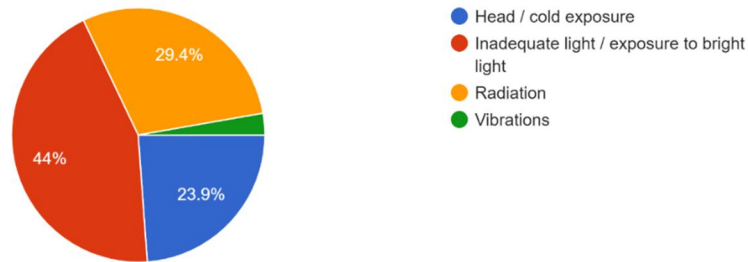
5) Most common cause of physical hazards you experienced?

Table 6: distribution of response to question 5

Question	Options	[n]	[%]	Chi-square	P-value	Significance
Most common cause of physical hazards you experienced?	Heat / cold exposure	26	23.6	25.61	0001	significant at p < .05
	Inadequate light / exposure to bright light	48	44			
	Radiation	32	29.4			
	Vibrations	3	2.8			

Fig 6: pie chart representation of percentage distribution of response to question 5
Most common cause of physical hazards you experienced?

109 responses



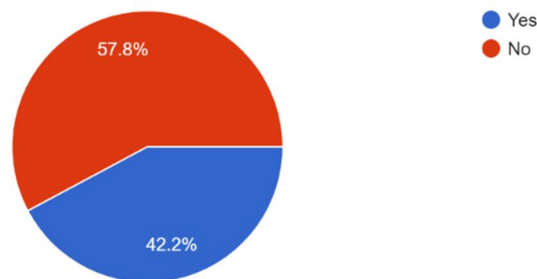
6) Have you experienced any musculoskeletal disorder or peripheral nervous disorder?

Table 7: distribution of response to question 6

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
Have you experienced any musculoskeletal disorder or peripheral nervous disorder?	Yes	46	42.2	0.17	0.6801	Not significant
	no	63	57.8			

Fig 7: pie chart representation of percentage distribution of response to question 6
Have you experienced any musculoskeletal disorder or peripheral nervous disorder?

109 responses



7) What is the most common pain you experience often?

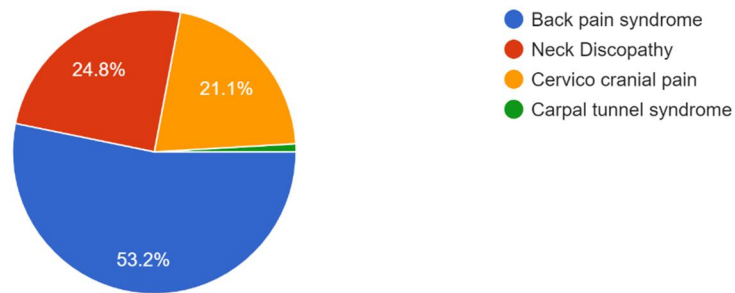
Table 8: distribution of response to question 7

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
What is the most common pain you experience often?	Back pain syndrome	57	53.2	30.66	<.0001	significant at p < .05
	Neck Discopathy	27	24.8			
	Cervico cranial pain	23	21.1			
	Carpal tunnel syndrome	1	0.9			

Fig 8: pie chart representation of percentage distribution of response to question 7

What is the most common pain you experience often?

109 responses



8) Precautions you follow to avoid this hazard in your practice

Table 9: distribution of response to question 8

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
Precautions you follow to avoid this hazard in your practice	Four hand dentistry	28	25.7	23.75	<.0001	significant at p < .05
	Good lightening	14	12.8			
	Magnification	9	8.3			
	Appropriate chair and patients' position	58	53.2			

Fig 9: pie chart representation of percentage distribution of response to question 8

Precautions you follow to avoid this hazards in your practice

109 responses



9) What is your preferred position for treating patients?

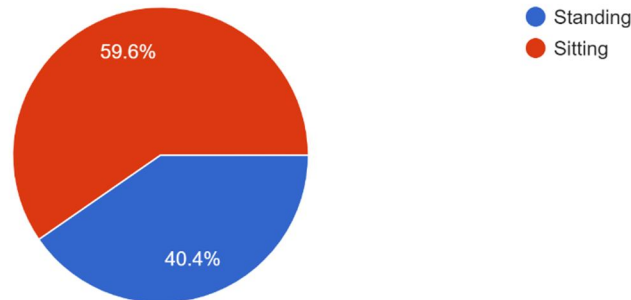
Table 10: distribution of response to question 9

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
What is your preferred position for treating patients?	Standing	44	40.4	0.47	0.493	Not significant
	sitting	65	59.6			

Fig 10: pie chart representation of percentage distribution of response to question 9

What is your preferred position for treating patients?

109 responses



10) Most common chemicals hazards in dentistry from your point of view?

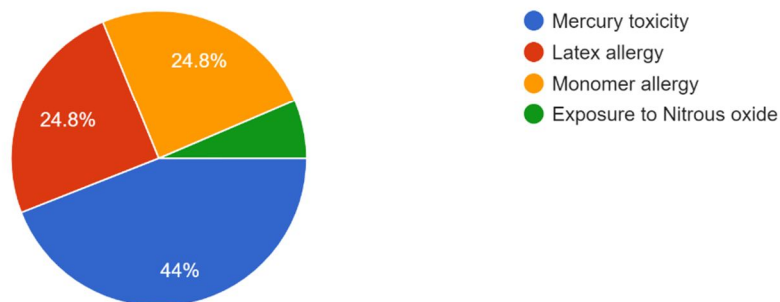
Table 11: distribution of response to question 10

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
Most common chemicals hazards in dentistry from your point of view?	Mercury toxicity	48	44	14.36	0.0025	significant at p < .05
	Latex allergy	27	24.8			
	Monomer allergy	27	24.8			
	Exposure to Nitrous oxide	7	6.4			

Fig 11: pie chart representation of percentage distribution of response to question 10

Most common chemicals hazards in dentistry from your point of view?

109 responses



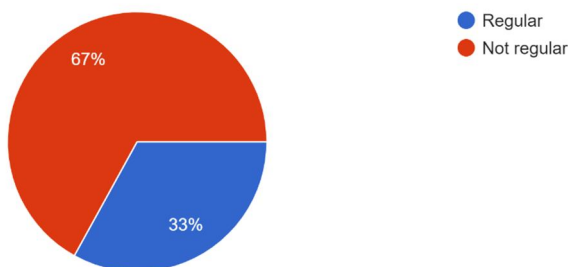
11) How often do you get contact with mercury?

Table 12: distribution of response to question 11

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
How often do you get contact with mercury?	Regular	36	33	9.03	0.0027	significant at p < .05
	Not regular	73	67			

Fig 12: pie chart representation of percentage distribution of response to question 11

How often do you get contact with mercury?
109 responses



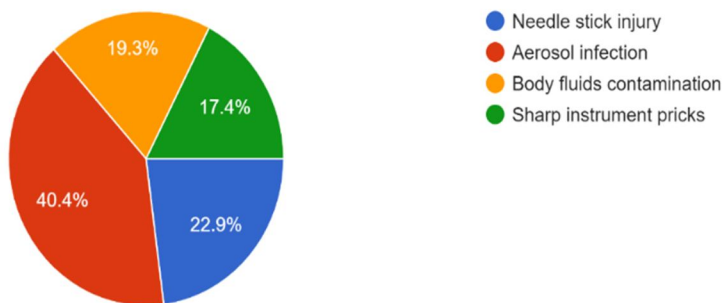
12) Most common biological hazards in your clinical practice

Table 13: distribution of response to question 12

Question	Options	[n]	[%]	Chi-square	P-value	Significance
		109	100			
Most common biological hazards in your clinical practice	Needle stick injury	25	22.9	6.78	0.0793	Not significant
	Aerosol infection	44	40.4			
	Body fluids contamination	21	19.3			
	Sharp instrument pricks	19	17.4			

Fig 13: pie chart representation of percentage distribution of response to question 12

Most common biological hazards in your clinical practice
109 responses



13) When do you get needle stick injuries often?

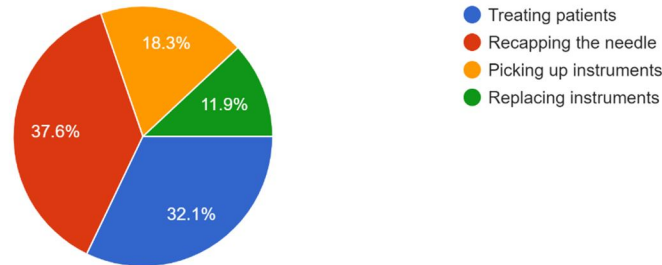
Table 14: distribution of response to question 13

Question	Options	[n]	[%]	Chi-square	P-value	Significance
		109	100			
When do you get needle stick injuries often?	Treating patients	35	32.1	8.54	0.0361	Significant at p < .05.
	Recapping the needle	41	37.6			
	Picking up instruments	20	18.3			
	Replacing instruments	13	11.9			

Fig 14: pie chart representation of percentage distribution of response to question 13

When do you get needle stick injuries often?

109 responses



14) Preventive measures which you follow to avoid effects of occupational hazards

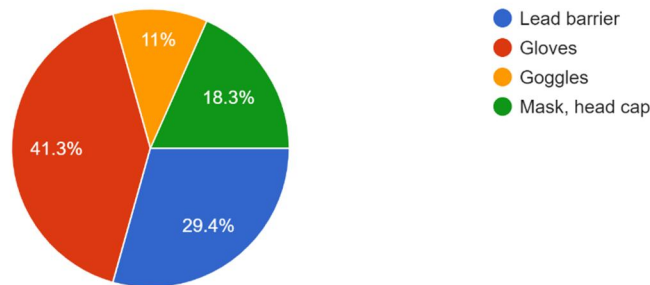
Table 15: distribution of response to question 14

Question	Options	[n]	[%]	Chi-square	P-value	Significance
Preventive measures which you follow to avoid effects of occupational hazards	Lead barrier	32	29.4	10.83	0.0127	significant at p < .05.
	Gloves	45	41.3			
	Goggles	12	11			
	Mask, head cap	20	18.3			

Fig 15: pie chart representation of percentage distribution of response to question 14

Preventive measures which you follow to avoid effects of occupational hazards

109 responses



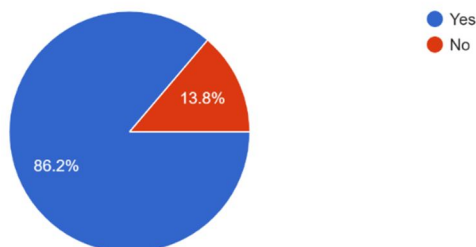
15) Did you have your Hepatitis vaccinations?

Table 16: distribution of response to question 15

Question	Options	[n]	[%]	Chi-square	P-value	Significance
Did you have your Hepatitis vaccinations?	Yes	94	86.2	37.83	0.0001	significant at p < .05
	No	15	13.8			

Fig 16: pie chart representation of percentage distribution of response to question 15

Did you have your Hepatitis vaccinations ?
109 responses



16) When did you get vaccinated?

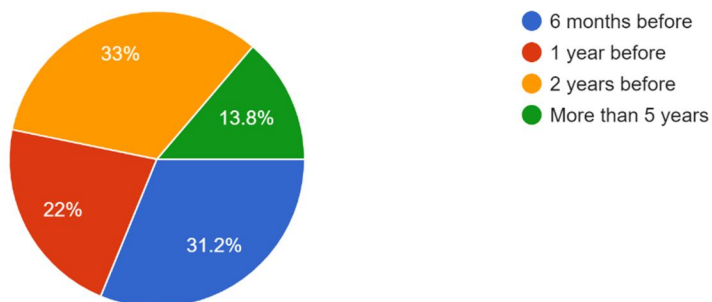
Table 17: distribution of response to question 16

Question	Options	[n]	[%]	Chi-square	P-value	Significance
When did you get vaccinated?	6 months before	34	31.2	6.71	0.0817	significant at p < .05
	1 year before	24	22			
	2 years before	36	33			
	More than 5 years	15	13.8			

Fig 17: pie chart representation of percentage distribution of response to question 16

When did you get vaccinated?

109 responses



17) Are you aware of noise induced hearing loss in dentistry?

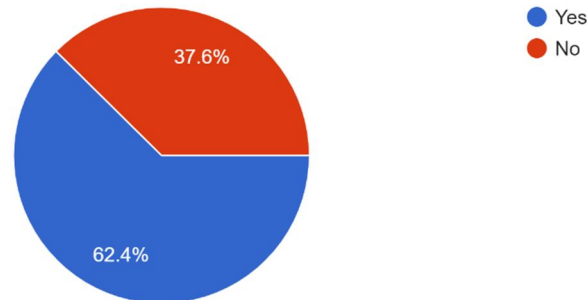
Table 18: distribution of response to question 17

Question	Options	[n]	[%]	Chi-square	P-value	Significance
Are you aware of noise induced hearing loss in dentistry?	Yes	68	62.4	0.93	0.3349	Not significant
	no	41	37.6			

Fig 18: pie chart representation of percentage distribution of response to question 17

Are you aware of noise induced hearing loss in dentistry?

109 responses



18) From your experience which is the most common noise hazards you are exposed to?

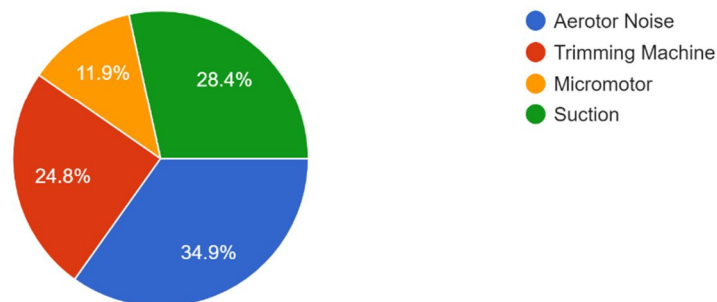
Table 19: distribution of response to question 18

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
From your experience which is the most common noise hazards you are exposed to?	Aerotator Noise	38	34.9	11.64	0.0087	significant at p < .05
	Trimming Machine	7	24.8			
	Micromotor	13	11.9			
	Suction	21	28.4			

Fig 19: pie chart representation of percentage distribution of response to question 18

From your experience which is the most common noise hazards you are exposed to?

109 responses



19) Common cause of eye infection / injury from your experience

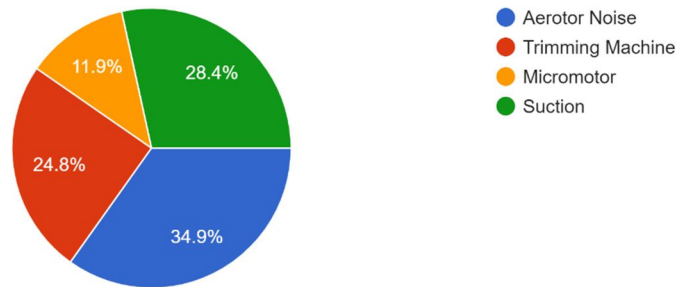
Table 20: distribution of response to question 19

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
Common cause of eye infection / injury from your experience	Calculus splattering	38	34.9	5.74	0.125	Not significant
	High speed handpiece	28	25.7			
	Dental light curing unit	28	25.7			
	Infrared radiation exposure	15	13.8			

Fig 20: pie chart representation of percentage distribution of response to question 19

From your experience which is the most common noise hazards you are exposed to?

109 responses



20) How do you manage needle stick injuries?

Table 21: distribution of response to question 20

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
How do you manage needle stick injuries?	Put finger in the mouth to stop bleeding	21	19.3	8.78	0.0124	significant at p < .05
	Press the blood to remove pathogens	29	26.6			
	Wash under running water without giving pressure	51	54.1			

Fig 21: pie chart representation of percentage distribution of response to question 20

How do you manage needle stick injuries?

109 responses



21) Have you attended any workshop on occupational hazards?

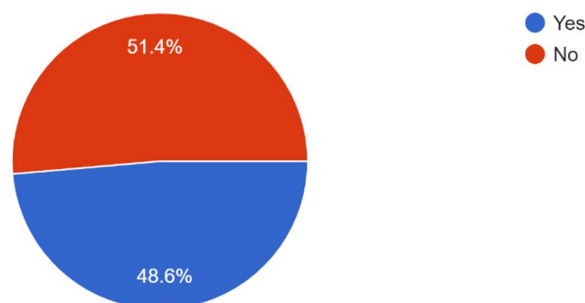
Table 22: distribution of response to question 21

Question	Options	[n] 109	[%] 100	Chi-square	P-value	Significance
Have you attended any workshop on occupational hazards?	Yes	53	48.6	0.07	0.7913	Not significant
	no	56	51.4			

Fig 22: pie chart representation of percentage distribution of response to question 21

Have you attended any workshop on occupational hazards?

109 responses



III. RESULTS

A total of 109 dental students actively engaged in this survey, with 82.6% being females and 17.4% males. The mean age of participants was 22.4 years old. The distribution of participants included 45.9% interns [CRRI], 21.1% postgraduate students, 21.1% 3rd-year undergraduate students, and 11.9% 4th-year undergraduate students. Regarding occupational hazards, 46.8% identified psychological hazards as the most common, with 47.7% specifically citing stress as a prevalent psychological hazard in dentistry. Of those experiencing psychological hazards, 56% attributed it to factors related to patients, practice, and finances. To cope with these challenges, 50.5% mentioned spending time with family and friends as a means of overcoming psychological stress. In terms of physical hazards, 44% reported inadequate light or exposure to bright light as a common issue. Interestingly, 57.8% had not experienced musculoskeletal or peripheral nervous disorders, while 53.2% had encountered back pain syndrome. Preventive measures included appropriate chair and patient positioning (53.2%) and four-hand dentistry (25.7%). The preferred position for treating patients was sitting, according to 59.6% of respondents. Concerning chemical hazards, 44% perceived mercury toxicity as the most common in dentistry, though 67% stated they did not regularly come into contact with mercury. Biological hazards, particularly aerosol infection, were identified by 40.4% as prevalent in clinical practice, with 37.6% reporting needle prick injuries while recapping needles. Preventive measures included the use of gloves (41.3%), and a majority (86.2%) had received hepatitis vaccination, with 33% having been vaccinated six months prior. Awareness of noise-induced hearing loss in dentistry was noted by 62.4% of participants, with 34.9% identifying aerotor noise as the most common noise hazard, followed by suction (28.4%), Micromotor, and trimming machine. Concerning eye infections or injuries, 34.9% attributed them to calculus splattering. In managing needle stick injuries, 54.1% washed under running water without applying pressure. Finally, 48.6% of participants had attended workshops on occupational hazards.

IV. DISCUSSION

Recently, a very few studies have been conducted on dental students globally to evaluate their awareness and understanding of potential hazards at work. We were interested in hearing the dental students in tamilnadu's answer. It is common knowledge that a sound body and mind can function well on their own. Therefore, maintaining the health of the dentists is crucial to the success of the dental practise. Even if there have been recent technological advancements in other sectors, occupational health hazards are still a persistent problem in dentistry. The primary aim of this study is to explores occupational hazards among dental students, emphasizing psychological, physical, chemical, and biological risks. A structured questionnaire, approved by the institutional review board, collected data on demographics, occupational hazards, and safety practices, statistical analysis employed vassarstats and psp. From our study, participants (82.6% female, mean age 22.4) identified psychological hazards (46.8%) and inadequate lighting (44%) as common concerns. Mercury toxicity (44%) and aerosol infection (40.4%) were notable chemical and biological hazards.

From present study, psychological hazards have surfaced as a notable concern, with almost half of the participants, 46.8% acknowledging them as the most prevalent hazards. Stress, as highlighted by 47.7%, underscores the significant impact of psychological challenges in dental education. A study conducted by Srinivasan Bhuvaneshwari et al. similarly found stress to be a significant psychological hazard, with a prevalence of 50%.^[12] Additionally, another study by Mehta identified job-related stress as an occupational problem in 43.3% of cases^[13].

This study sheds light on the contributing factors to psychological stress, revealing that 56% attribute it to issues related to patients, challenges within their practice, and financial concerns. Physical hazards, exemplified by issues like inadequate lighting, were experienced by 44% of participants in our study. In a study conducted by Reddy et al., a higher percentage, 92.4% of dentists, reported encountering physical hazards^[14]. A majority of participants in our study (57.8%) had not experienced musculoskeletal or peripheral nervous disorders. This contrasts with findings from a study by Srinivasan Bhuvaneshwari et al., where 88% of participants faced musculoskeletal hazards^[12]. In our study investigation, 53.2% of participants reported experiencing back pain syndrome. Rafie et al. explored posture factors contributing to musculoskeletal disorders in dentists, finding that improper work posture had a significant impact^[15]. Chopra and Pandey also highlighted backache as a common hazard, emphasizing the importance of awareness about preventive measures^[16]. This study recognized preventive strategies, such as appropriate chair and patient positioning and the implementation of four-hand dentistry, as effective measures to alleviate physical hazards. These findings align with the broader literature emphasizing the significance of ergonomic practices in dentistry to mitigate the risk of physical ailments among dental professionals. This current investigation delves into chemical hazards, with 44% of participants identifying mercury toxicity as a prevalent concern, even though 67% indicated limited regular contact with mercury. But the study conducted by RZ Adam et al., where Most dentists, about 62% reported almost never using dental amalgam and an almost equal number, 63% repaired defective amalgam restorations^[17]. Biological hazards, specifically aerosol infection, were acknowledged by 40.4% of participants, and 37.6% reported needleprick injuries while recapping needles. In a study conducted by Semra Eyi, needle stick injuries were reported at a prevalence of 27.8%^[18]. These findings underscore the significance of addressing chemical and biological hazards in dental practice to safeguard the well-being of dental professionals and mitigate potential health risks associated with exposure to substances like mercury. Demonstrating a proactive safety approach, 86.2% of participants in our study had received hepatitis vaccination. This aligns with a study by Srinivasan Bhuvaneshwari et al^[12]. where 82% of participants were vaccinated against hepatitis. However, a study by Redhwan A. Al-aslami found that 74% of participants were vaccinated against Hepatitis B, potentially reflecting differing attitudes among students about their risk of exposure^[19]. It is emphasized that proper vaccination against Hepatitis B is desirable for all students due to the risk of body fluid-borne infection. Furthermore, this study revealed that 48.6% of participants had attended workshops on occupational hazards, underscoring the significance of educational initiatives in raising awareness and promoting safety. In contrast, the study by Redhwan A. Al-aslami reported that only 33% of participants had attended workshops or conferences on occupational hazards^[19].

V. CONCLUSION

In conclusion, this study provides valuable insights into the occupational hazards faced by dental students, offering a comprehensive perspective on their experiences. The findings highlight the importance of addressing psychological stressors, implementing preventive measures for physical challenges, and enhancing awareness and education on chemical and biological hazards. The results can serve as a basis for targeted interventions to establish safer learning environments for dental students and contribute to future research on occupational safety in dental education.

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