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EDITORIAL

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The Essential Role of Patient Safety and Quality of Care Offices in Ensuring Excellence in Dental Institutions

Farhan Raza Khan[1]

The dental clinics of public and private sector medical and dental colleges and universities offer a substantial volume of services to the patient. In these clinics, most of the service providers are students, interns, residents, and junior faculty. Because of the nature of the discipline of dentistry, most of the patient care involves procedures and interventions, and some of the interventions are irreversible too.

Although, on paper, clinical supervision and mentorship are available to trainees, in essence, 1:1 supervision by the instructors is nearly impossible. Thus, negligence and procedural errors are inevitable. The irony is that in Pakistani dental institutions, there is no formal mechanism to document the magnitude of the problems and patient grievances. Mostly, the patients who visit dental schools for their treatment are not financially well-off. These patients cannot afford the expensive dental care offered in the private practice. The patient does not have high expectations from the students or trainee clinicians who run clinics either. However, as patients, they have the very right to care and deserve to be treated with the best possible care in the given circumstances. The challenge is that the faculty and dental school administrators already know that there are grievances to the patients but there is no formal mechanism to address them. Common dental problems such as ill-fitting dentures, separated root canal files, post-extraction incidence of dry sockets, fitted crowns with open proximal contacts etc. remain undocumented due to the lack of a formal mechanism and an office to report the grievances of the patients regarding the rendered services. Most complaints are real and should be addressed.[1] The common problems in a dental care setup can be attributed to inexperienced student providers, less efficient delivery of care, challenges related to continuity of care, and the complexity of adhering to institutional policies.[2]

This is important in the context of accountability. As health care providers, clinicians should be open to being held accountable for the outcomes of the services they offer. This assures a high standard of care in the clinics and offers an opportunity for quality assurance to the patients who are at the receiving end of the care. There is no point in the assessment of the quality of care when we have not done anything for quality assurance.

Patient satisfaction is an integral part of assessing the quality of oral health care. A study reported that the complaints observed in dental school clinics were regarding appointment communication, money, quality, and others. Most importantly, it was found that the system for recording complaints needed to be standardized to improve the quality of patient care.[3]

The scientific approach to manage the grievances of dental patients visiting public or private sector institutions is to advise on establishing a "patient complaints, safety and quality of care office" or simply QCO. This office should ideally be staffed with personnel with proper training and behaviour to manage patient complaints. The phone number and email address of the QCO should be displayed in all the OPDs of the institution. After establishing an easy-to-use channel and raising patients' awareness, the next step would be the documentation and analysis of complaint data (e.g. creating structures and processes for the analysis and management of complaints). The following step would be the action (e.g. timely feedback to complainants). And lastly, there should be some learnings from complaints data for the future improvement of the service quality. All these steps are integrated and can only be done seriously if there is a proper QCO in the dental institution.

QCO can have a broader role in dental institutions. This office could be the focal office to deal with the provincial health care commission on patient-related matters. Similarly, QCO can be the frontline office in dealing with PMC and HEC for the staff credentialing and licensure maintenance etc. Similarly, the same

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office can offer training on quality assurance and assessment to the staff onboard. Measuring patient satisfaction is a key indicator of healthcare institutions' success.[4]

Lastly, it is imperative to understand that QCO will not police the dentists but rather should act as the office to protect the clinicians by training them to be better and safer clinicians. The quality of care can only improve if all the stakeholders work together as a team.[5] It's high time that dental professionals realize the need to offer better care to our marginalized and vulnerable patients in the student clinics. Without a CQO, the dental patients in the student's clinic would continue to suffer. This couldn't be described more suitably than the following lines from the writing of famous Urdu poet (late) Mustafa Zaidi:

maiñ kis ke haath pe apnā lahū talāsh karūñ

tamām shahr ne pahne hue haiñ dastāne

DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

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Not applicable.

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Assessing COVID-19 Perceptions, Practices and Vaccine Reluctance Amongst Dental Students and Dentists in Karachi – A Mixed Method Study

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ABSTRACT

Objectives: The coronavirus disease (COVID-19) pandemic has posed a global threat to the lives of many. This mixed-methods study aimed to assess the parameters of knowledge, attitude, and practices concerning the COVID-19 pandemic, along with vaccine hesitancy among the dental fraternity of Karachi, Pakistan.

Materials and Methods: A cross-sectional survey was conducted among 300 dentists, dental students, and faculty of selected dental facilities and institutes in Karachi, Pakistan, from March 2021 to April 2021. A close-ended questionnaire evaluated the knowledge, attitude, and practice towards COVID-19. Results were assessed using a scoring system, and a chi-squared test was performed to detect significant ($p < 0.05$) differences among various variables. To explore the reasons behind the observed attitudes and practices, as well as vaccine hesitancy, semi-structured interviews were conducted with a subset of 21 respondents, selected using purposive sampling. The interview guide was developed to probe participants' understanding of COVID-19, their experiences and challenges in adhering to protocols, and their perceptions and concerns about the COVID-19 vaccine. All interviews were audio-recorded, transcribed, and analysed using thematic analysis.

Results: More than 80% of respondents displayed good knowledge regarding the mode of transmission, diagnostic methods, and symptoms of COVID-19. Less than 50% believed they had adequate training and protocols to treat the affected patients. COVID-19 guidelines on a personal level, like masking and distancing, were followed by almost 90% of the respondents. Several themes emerged from the interviews, including fear and anxiety related to contracting the virus, concerns about the efficacy and safety of the vaccine, perceived lack of support and resources to follow guidelines and scepticism about the government's handling of the pandemic.

Conclusion: We found that the subjects had adequate awareness of COVID-19, but their belief in the government's health policy was negligible. The qualitative findings shed light on the factors contributing to these attitudes and behaviours, including fear, lack of resources, and distrust. Policies should be implemented to improve practices, address fears and misinformation, and enhance the dental fraternity's contribution to the fight against the pandemic.

Keywords: Attitude, COVID-19, Dentists, Knowledge, Vaccine Hesitancy

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INTRODUCTION

Viruses have afflicted humanity through major pandemics throughout history. In the past two decades, the SARS-CoV (Severe Acute Respiratory Syndrome Coronavirus) in 2002-2003 and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2012 have posed significant risks to public health.[1] In 2019, the SARS-CoV hit the world again. As a Coronaviridae RNA virus, this Novel virus is single-stranded and zoonotic, which means it can transmit from animals to humans.[2] Primary symptoms of COVID-19 include fever, myalgia, dry cough, and abnormal chest scans.[3] It transmits from one human to another through air droplets generated by sneezing or coughing, touching contaminated surfaces, or coming in direct contact with an infected/asymptomatic person. Like other viruses, it may also be transmitted through saliva or blood.[4] In Pakistan, the first COVID-19 case was reported on 26 February 2020, and a complete lockdown followed on 23 March 2020.[5] Death is not the only grave consequence of this pandemic; it has also affected the psychological well-being of people. Furthermore, having no specific treatment has aggravated the catastrophic effect of this virus.[6,7]

The provision of dental care is a risky predicament during the pandemic.[8] Dentistry has been included in the high-risk category due to the close contact during treatment procedures. Common dental treatment procedures include using instruments like ultrasonic scalers, air polishing, high- and low-speed handpieces, and air-water syringes. Aerosols produced during dental procedures may contain pathogenic viruses and bacteria, posing a serious threat to dentists and other staff members.[9]

Despite the availability of recommended guidelines by the WHO (World Health Organization),[10] dentists are not fully complying with the mandatory measures.[4] Adequate knowledge and practices have played a vital role in controlling outbreaks.[11] Moreover, vaccines have become the first line of defence. Healthcare workers were the first to get vaccinated, but there is conflicting evidence regarding the acceptance of vaccines.[11] Factors such as lack of awareness, concerns regarding safety, and distrust in government bodies are responsible for vaccine hesitancy.[12] Therefore, this study aimed to explore perceptions, attitudes, and practices regarding COVID-19 and investigate COVID-19 vaccine hesitancy among dentists and dental students in Karachi, Pakistan.

MATERIALS AND METHODS

The study population comprised undergraduates, graduates, dental faculty, and practising dentists in the OPDs (Outpatient departments) and clinics of the South district of Karachi, Pakistan. A convenience sampling technique was employed to recruit undergraduates, graduates, and dentists. This cross-sectional study was conducted for two months, from March 2021- April 2021. A questionnaire designed on Google Forms was circulated through social media apps. For the qualitative portion, focus group interviews were conducted through online Zoom sessions for 45 minutes with those participants who consented and contacted through email. All interviews and surveys were done following the Declaration of Helsinki of 1964. Informed consent was obtained from all the participants. Ethical approval was obtained from Sir Syed Dental College's Ethics Review Committee Ref. No. SSCMS/ College/ Principal (Dental)/2022/059.

The questionnaire was developed in English, the primary language in Pakistan's higher education system. To ensure the accuracy of the questionnaire, a small sample of participants was selected for pretesting (n=25). The participants' socio-demographic and professional details were asked in the first section, including age, education, gender, marital status, job title, and years of experience. The second section comprised knowledge questions regarding COVID-19, including the mode of transmission, incubation period, and diagnostic methods. The third section included participants' perceptions, and the fourth section was about dentists' practices. The responses were categorised as correct responses with a value of 1 and wrong responses of 0.

In the qualitative component of the study, semi-structured interviews were conducted to gain an in-depth understanding of the participants' experiences, attitudes, practices, and views on the COVID-19 vaccine.

Data Collection: Semi-structured interviews were chosen for this stage of the study, as they allow for flexibility in questioning, enabling the interviewer to probe deeper into the participants' responses. An interview guide containing open-ended questions and

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prompts relating to the study objectives was developed. This guide provided a basic structure for the interviews but allowed the discussion to evolve naturally based on the participants' responses. The interviews were conducted via Zoom™ video call, depending on the participants' preferences and the ongoing pandemic-related restrictions. The interviews were recorded digitally using audio recorders on mobile phones, followed by handwritten transcriptions. Theme analysis was carried out on the digital data using NVivo®. A framework analysis consists of five steps: familiarisation, identifying a theme framework, indexing, charting, and mapping.[14] In the familiarisation stage, the transcribing data were grouped into different themes based on the differences between the participants' responses.

Sampling: A purposive sampling strategy was used to select a subset of 21 participants from the larger group of 300 who participated in the quantitative survey. This strategy involved selecting participants who could provide rich, relevant, and diverse insights related to the research questions. The sample included a mix of dentists, dental students, and faculty members from selected dental facilities and institutes in Karachi, Pakistan.

Grounded Theory: In this study, the interviews were first transcribed verbatim. Then, using the principles of grounded theory, the transcriptions were reviewed line by line to identify initial concepts. Grounded theory is a systematic qualitative research methodology that involves collecting and analysing data to develop a theory grounded in the data itself.

These initial concepts were then grouped into more abstract categories based on their similarities and differences. These categories were further refined and connected to form a theoretical framework explaining the participants' knowledge, attitudes, and practices concerning COVID-19 and their perceptions and concerns about the COVID-19 vaccine. A thematic framework was then developed after identifying four main themes: Knowledge of COVID-19, Attitude towards COVID-19 protocols, Practices concerning COVID-19 and Vaccine Hesitancy. Codes were assigned to these themes, and indexing was performed for the numerical annotation of transcripts to identify consistencies. Responses were categorised and coded through the charting process by abstraction and discrimination. A revised thematic framework was devised in the stage of mapping and interpretation, in which the themes were interrelated and correlated to understand the different themes and their association based on participants' responses.

The process of data analysis in grounded theory is iterative, meaning that the researchers may go back and forth between the data and their emerging theoretical framework to refine their understanding. They may also use theoretical sampling to gather more data if they identify gaps in their understanding during the analysis process. Thus, the qualitative component of this study provided a detailed and nuanced understanding of the issues being studied, complementing the more general findings from the quantitative survey.

SPSS version 21 was used to analyse the data. Numbers and percentages were used to compute results on categorical measurements. Descriptive statistics were performed, and data were reported as percentages and frequency. Chi-square tests of significance (Fisher's exact test) were used with a 95% confidence interval ($p < 0.05$) to establish a significant relationship between tested variables.

RESULTS

Three hundred seventy participants were given an online survey on Google Forms, but only 300 responses were received (male: 44%, female: 56%) responded, producing a response rate of 81%. Of the 300, 117 were undergraduates, 159 were graduates, and 24 were postgraduates. The survey revealed that 7% of respondents were faculty members at dental institutes, 40% were dental students, 36% were dental interns, and 17% were general dental practitioners. The demographic data are shown in Table 1. Subjects examined in Angle Class I was 90 (66.2%), 38 (27.9%) subjects were examined in Class II and 8 (5.9 %) subjects were examined in Class III as shown in Table 2.

Table 2 shows the correct responses to the domain of knowledge from different perspectives. A closed-ended questionnaire assessed this with dichotomous options. There was a general awareness of the COVID-19 virus, but 2% did not correctly answer the source of transmission. Regarding its spread from person to person, 99% correctly answered, while 44 per cent did not know that it may affect more than once in life. Thirty-seven per cent of the respondents believed that the virus could lead to death. Eighty-eight per cent also

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believed that symptoms appeared within 14 days. Nasopharyngeal swabs were regarded as a diagnostic tool by 84%. A majority (84%) of the participants were unsure if it was safe to communicate after recovery (Table 2)

The results of the participants' attitudes toward COVID-19 have also been summarised in Table 2. Almost 5% of the participants were neutral about temperature screening at the country's entry points. Only 22% agreed when asked whether dentists were prepared for the pandemic. Most people (98%) strongly agreed that hand hygiene was essential for prevention, and 279 participants seemed unsatisfied with government policies regarding COVID-19 and believed that the government needs to take more stringent measures to control this pandemic. Similarly, only 93 (31%) participants thought they had followed proper infection prevention protocols.

Regarding the practices summarised in Table 2, 52% did not wear an N-95 mask. 87% of the participants inquired about viral symptoms from their patients in their daily routine. Additionally, 52% said symptomatic patients should only be treated for dental emergencies. Forty-seven per cent of dental offices lacked handwashing stations or sanitisers in the waiting rooms, and seventy-two per cent said they would refer an emergency dental case of a suspected COVID-19 patient to a relevant hospital. According to 83% of respondents, masking and distancing the patient is the most effective way to prevent transmission in an OPD.

Based on a comparison of knowledge, attitude, and practices with different demographic variables in Table 3, participants aged 18-27 had adequate knowledge, showing a statistically significant p-value of 0.246. Moreover, single students (*p*-value: 0.001) and professionals with 1-2 years of experience (*p*-value 0.005) had adequate knowledge about the impact of COVID-19 on humans. Participants practising dentistry for 1-2 years and house officers reflected more awareness with significant p-values than other groups. However, no difference was seen with gender, except that females had a more positive attitude than males.

For in-depth interviews, 35 individuals were initially approached. Of these, 21 participants agreed to participate, with a response rate of 60%. The four main themes identified through qualitative analysis were:

Table 1: Socio-demographic variables of the study participants

Variable	Categories	N (%)
Age	18-27 years	279 (93%)
	28-37 years	9 (3%)
	38-47 years	12 (4%)
Education	Undergraduate	117 (39%)
	Graduate	159 (53%)
	Postgraduate	24 (8%)
Gender	Male	132 (44%)
	Female	168 (56%)
Marital status	Single	225 (75%)
	Married	72 (24%)
	Prefer not to say	3 (1%)
Designation	Faculty	21 (7%)
	Student	120 (40%)
	House officer	108 (36%)
	General practitioner	51 (17%)
Years of practice	1-2 years	252 (84%)
	3-4 years	27 (9%)
	5 years or more	21 (7%)

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Table 2: Study participants' knowledge, attitudes, and practices regarding the COVID-19 pandemic

Qs	Statements	N	%
Knowledge		Correct answers	
K 1	COVID -19 infection is a pandemic	300	100%
K 2	Coronavirus is the main cause of this disease	294	98%
K 3	COVID -19 virus may spread from person to person	297	99%
K 4	COVID -19 may affect humans more than once in a life	168	56%
K 5	Air droplets or physical contact may act as the primary route of transmission of this disease	195	65%
K 6	Signs and symptoms of the disease are the same as seasonal flu (fever; cough, sore throat, muscle ache, etc.	270	90%
K 7	Symptoms of the disease may appear within 2 weeks of getting infected	264	88%
K 8	Diagnosis is made by nasopharyngeal swab	252	84%
K 9	The severe form of the disease can become fatal	111	37%
K 10	After 14 days, an infected person who was cured of the disease can communicate with others recovering	48	16%
Attitude			
A1	Yes, I think there should be temperature screening at the entry point of the country	286	95.3%
A2	Yes, we should avoid leaving our homes unnecessarily	270	90%
A3	Yes, I think dentists are prepared to deal with pandemic outbreaks like the coronavirus	66	22%
A4	Hand hygiene is necessary to prevent the spread of coronavirus	294	98%
A5	Standard isolation precautions are necessary to prevent infection transmission	279	93%
A6	I would get vaccinated once vaccination is available	199	66.3%
A7	I think available information is enough to treat patients during the pandemic	133	44.3%
A8	Yes, an intensive care unit is required for the diagnosed patient in a serious condition	246	82%
A9	Yes, there are proper guidelines or protocols to treat an infected patient	93	31%
A10	Yes, the government should take stricter preventive actions against this pandemic disease	279	93%
Practice			
P1	Yes, I wear an N95 mask as a preventive measure	144	48%
P2	I do take proper distance from an infected patient	282	94%
P3	Masking and distancing the patient is the most important respiratory precaution taken to prevent transmission in an OPD	249	83%
P4	PPE should be removed and discarded upon exit from the room of an infected patient	285	95%
P5	In dental practice & OPDs, patients are asked about symptoms (fever, dry cough & flu) related to coronavirus & their travel history	261	87%
P6	Yes, an asymptomatic patient without any dental emergency should not be treated	156	52%

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P7	In dental practice, awareness signs related to the prevention of coronavirus are displayed at the patient's end	93	31%
P8	Alcohol-based sanitiser and handwashing facilities are available in waiting areas of dental practices	159	53%
P9	The same treatment protocols are followed to deal with emergency or elective patients	108	36%
P10	Emergency dental cases of suspected coronavirus patients are referred to relevant hospitals	216	72%

[a]*Chi-square test*

Knowledge of COVID-19, Attitude towards COVID-19 protocols, Practices concerning COVID-19 and Vaccine Hesitancy. The four themes with assigned codes and representative sentences are displayed in Table 4.

Table 3: Comparison of knowledge, attitude and practice with socio-demographic variables

Variables		**Knowledge**		**Attitude**		**Practice**	
		Adequate	Inadequate	Positive	Negative	Good	Poor
Education	Undergraduate	101	16	72	45	48	69
	Graduate	134	25	122	37	84	75
	Postgraduate	24	0	16	8	18	6
		0.085[£]		0.021[£]		0.005[£]	
Years of Practice	1-2 years	211	41	169	83	126	126
	3-4 years	27	0	21	6	9	18
	5 years > 5	21	0	20	1	15	6
		0.005[£]		0.017*		0.032*	
Designation	Student	21	0	14	7	12	9
	House officer	104	16	73	47	42	78
	Faculty	83	25	86	22	57	51
	General practitioner	51	0	37	14	39	12
		*<0.001**		*0.020**		*<0.001**	
Age	18-27 years	238	41	196	83	135	144
	28-37 years	9	0	8	1	9	0
	38-47 years	12	0	6	6	6	6
		0.246[£]		0.189[£]		*<0.006*[£]	
Gender	Male	107	25	83	49	69	63
	Female	152	16	127	41	81	87
		*0.018**		*0.017**		0.485*	
Marital status	Single	205	20	154	71	99	126
	Married	54	18	53	19	51	21
	Prefer not to say	0	3	3	0	0	3
		<0.001[£]		0.478[£]		*<0.001*[£]	

[a]*Chi Square test*

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Table 4: Themes of COVID-19 hesitancy

Theme	Category	Codes	Representative Sentence
Knowledge of COVID -19	Understanding of transmission modes	FUA1	"I know that COVID-19 can be spread through droplets when an infected person coughs, sneezes, or talks."
	Recognition of symptoms	FUA2	"The common symptoms are fever, cough, loss of smell or taste, and difficulty in breathing."
Attitude towards COVID -19 protocols	Adherence to guidelines	FAB1	"I always ensure to wear a mask and maintain a safe distance from patients."
	Perception of training adequacy	FAB2	"I don't feel we were given enough training to handle this kind of pandemic situation."
Practices concerning COVID -19	Implementation of guidelines	FPA1	"In our facility, we have strict guidelines that we follow, like sterilising instruments and sanitising surfaces regularly."
	Personal protective mea sures	FPC1	"I always wear a mask, use sanitisers frequently, and avoid touching my face."
Vaccine Hesitancy	Safety concerns of COVID-19 vaccine	FGA1	“COVID-19 vaccines are unsafe for humans as they can cause severe immune disorders and allergies. People are dying from vaccines.”
	Fear of adverse events	FGA2	“I have heard COVID-19 will make you infertile.”
	Possibility of COVID-19 from vaccine	FGB2	“My friend at work recently contracted COVID-19 from the vaccine. Vaccines are spreading COVID-19.”
	Pharmaceutical companies influence vaccine policies	FGC1	“American and British companies are selling their vaccines for earning profit from third world countries.”
	Long -term efficacy of vaccines	FGD1	“If vaccines are so effective, then how come vaccine companies are recommending booster doses now and then?”

DISCUSSION

This study's demographic distribution of respondents is comparable to other studies conducted on similar populations. In 2020, Al-Hanawi and colleagues conducted a study on the knowledge, attitudes, and perceptions of healthcare workers toward COVID-19 in Saudi Arabia. In that study, the sample consisted of 57% males and 43% females, and students represented a significant portion of respondents, similar to this study.[13]

The general awareness of COVID-19 transmission and symptoms is also reflected in similar studies. In a study by Kamate and colleagues, most of the dental students (95%) knew about the common symptoms and mode of transmission of COVID-19.[3] However, this study found that only 37% recognised that the virus could lead to death, which is lower than expected considering the gravity of the situation and the worldwide reporting of COVID-19 mortality. This discrepancy might be due to differences in the sample or the time of the study, which can impact the evolving understanding of COVID-19. Moreover, 84% of respondents recognise nasopharyngeal swabs as a diagnostic tool is consistent with a study by Bhagavathula et al. (2020), indicating a high level of knowledge about COVID-19 diagnostic procedures among healthcare workers.[14]

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The participants' attitudes towards COVID-19 and dissatisfaction with the government's policies mirror a global sentiment. A study by Pagnini et al. (2020) found a widespread belief that government measures were inadequate among healthcare workers in Italy, reflecting dissatisfaction with the response to the pandemic.[15] It indicates that healthcare professionals worldwide desire more proactive and effective governmental measures.

The practices observed in the study reflect both positive aspects (87% inquiring about symptoms, 83% practising masking and distancing) and areas of concern (52% not wearing N95 masks, 47% of dental offices lacking handwashing or sanitiser facilities). These are important findings that can guide interventions to improve practices among dental professionals. A study by Ahmed et al. (2020) similarly reported inadequate practices, suggesting the need for further training and resources to ensure adherence to recommended protocols.[16]

Regarding demographic correlations, a study by Tomar et al. (2020) found that younger age and being a student were associated with higher knowledge about COVID-19, which aligns with the findings of this study.[17] The gender differences in attitudes align with a study by Zhong et al. (2020), which found that females generally showed a more positive attitude towards disease prevention.[18]

In this study, researchers investigated how the dental fraternity deals with the COVID-19 virus daily and the routine application of their beliefs. An overwhelming majority of the respondents knew about the COVID-19 virus and its spread, which aligns with the findings in China, where 90% of the respondents were aware.[19] Most respondents (84%) were unsure whether communicating with a recovered patient was safe. It could be because of the early days of the pandemic and the lack of surety regarding interaction with the infected. Even though the Centers for Disease Control and Prevention (CDC) suggests a 14-day quarantine, recent research indicates that these patients may still be carriers.[20,21]

In our study, we investigated the awareness of the incubation period, the mode of transmission, and diagnostic methods for COVID-19. Participants of this study were better aware of the modes of transmission of COVID-19 (84%) compared to the study in Saudi Arabia, where half of the respondents were unaware of the person-to-person transmission source.[13] Although WHO recommends using the N95 mask as a preventive measure, approximately 52% of participants did not use N95 masks.[22] This finding was alarming and contrasted with the study in India.[23] We believe the lack of availability of N95 masks could be a reason for this difference. Contrary to a study in Nigeria, single participants were significantly more knowledgeable than those with partners. However, this can be due to our study's high number of single participants.[24] Only 22% of respondents said they were trained to deal with this pandemic based on WHO guidelines. The results of this finding were lower than those of a multinational study, in which 43% claimed to be trained.[3] This shows a lack of training on the government's part. This study found a low level of practice (50%) among the participants, which contrasts with studies in China and Pakistan.[25,26]

Participants believed that the government had not done enough to combat this epidemic. This finding was inconsistent with the one in China, where a considerable number of people believed that their government would be able to tackle this deadly virus.[19] Economic turmoil also renders less belief in the government, which could explain the difference. To disrupt the transmission chain, isolating the patient and providing palliative treatment is essential.[27] It was encouraging to find out that 83% of respondents in our study agreed that masking and isolating the patient was necessary, and a further 95% believed that personal protective equipment (PPE) should be discarded after exiting the room of a COVID-19-positive patient. Surprisingly, fresh graduates were more knowledgeable than postgraduates in this study, and this finding was inconsistent with a study in India where postgraduates exhibited a higher knowledge score.[28] The Main reason for the contrasting difference could be that undergraduate students were more in number than postgraduate students in our study.

Knowledge of COVID-19: The first theme identified through qualitative analysis of interviews was “Knowledge of COVID-19”. Two categories were identified: "Understanding of Transmission Modes” and “Recognition of Symptoms.”

"I know that COVID-19 can be spread through droplets when an infected person coughs, sneezes, or talks."

(FUA1)

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This response indicates an accurate understanding of the primary mode of COVID-19 transmission, which is crucial for implementing effective prevention measures. As per WHO guidelines and various research papers, this knowledge is essential for healthcare providers, including dentists who work close to patients' oral cavities. However, this statement doesn't touch upon airborne transmission or transmission via surfaces, which might be areas where knowledge enhancement could be beneficial.

"The common symptoms are fever, cough, loss of smell or taste, and difficulty in breathing." (FUA2)

The respondent correctly identifies some of the common symptoms of COVID-19, as per the CDC and WHO guidelines. This knowledge is critical for self-monitoring and for recognizing potential COVID-19 cases among patients. However, it would be useful to delve deeper into whether respondents are aware of other symptoms and non-specific presentations of the disease, particularly as new variants emerge.

Attitude towards COVID-19 protocols: Two categories identified under this theme are "Adherence to guidelines" and "Perception of training adequacy".

"I always ensure to wear a mask and maintain a safe distance from patients)." (FAB1)

This indicates a positive attitude towards following recommended preventive measures, which is crucial for reducing the risk of transmission in healthcare settings. Research suggests a strong correlation between healthcare providers' attitudes and their adherence to COVID-19 guidelines. However, it would be important to probe further into other preventive measures being practised, such as hand hygiene and the use of other personal protective equipment.

"I don't feel we were given enough training to handle this kind of pandemic situation." (FAB2)

This highlights a significant concern about the lack of adequate training reported by healthcare workers globally during the pandemic. The feeling of being inadequately prepared can lead to increased anxiety and burnout among healthcare professionals. It underscores the need for continued professional development and support during public health emergencies.

Practices concerning COVID-19: The two categories identified under this overarching theme were Implementation of guidelines" and "Personal protective measures".

"In our facility, we have strict guidelines that we follow, like sterilising instruments and sanitising surfaces regularly." (FPA1)

This statement indicates that the respondent is working in an environment that has put infection prevention measures in place. This practice aligns with global recommendations for maintaining safe dental practices during the pandemic. However, the statement would need to be cross-checked with actual observations or audits to validate the self-reported practice.

"I always wear a mask, use sanitisers frequently, and avoid touching my face." (FPC1)

This is an important reflection of personal preventive behaviours. These behaviours, particularly mask-wearing and hand sanitising, have been shown in numerous studies to reduce the risk of COVID-19 transmission significantly. The adherence to these practices is encouraging, although the survey should ensure the respondent's understanding of proper techniques and situations requiring these precautions.

Vaccine Hesitancy: Under this theme, five categories were identified: Safety concerns about the COVID-19 vaccine, Fear of adverse events, the possibility of COVID-19 from the vaccine, pharmaceutical companies influencing vaccine policies and the long-term efficacy of vaccines.

"COVID-19 vaccines are unsafe for humans as they can cause severe immune disorders and allergies. People are dying from vaccines." (FGA1)

The main reasons for the safety concerns of COVID-19 were attributed to the lack of information about the new vaccines, with claims of allergies, severe side effects, immune disorders, and even death. Arguments were associated with general vaccination safety, inadequate testing, and preliminary clinical trials.

The representative statement underlines deep-rooted vaccine hesitancy characterised by beliefs that COVID-19 vaccines are unsafe and can cause severe health issues, even death. According to the representative sentence, these concerns stem primarily from a perceived lack of information about the vaccines, suspicions about the safety of vaccinations in general, perceived inadequacy of vaccine testing, and doubts

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about the preliminary clinical trials.

While it is true that vaccines, like any medication, can cause side effects, severe reactions such as anaphylaxis are exceedingly rare. For the vast majority of people, the benefits of vaccination far outweigh the risks, especially considering the severe outcomes of a COVID-19 infection, including the risk of death. Multiple studies and ongoing real-world evidence affirm the safety and efficacy of approved COVID-19 vaccines.

Moreover, the development and testing processes for these vaccines have been rigorous, with extensive preclinical and clinical trials conducted according to international standards and under the scrutiny of regulatory bodies. Although the development was accelerated, no steps were skipped.

The representative statement thus reflects misinformation or misunderstanding about COVID-19 vaccines, which could undermine vaccination efforts and public health. It underscores the urgent need for accurate, accessible, and persuasive public health communications to dispel myths and build confidence in COVID-19 vaccines. In addition, it highlights the necessity of transparency and openness about vaccine development processes, side effects, and the system in place for reporting and monitoring adverse events. The source of information also matters greatly, as studies have shown that healthcare professionals are among the most trusted sources of health information for the public. Therefore, ensuring that healthcare professionals are well-informed and equipped to address patients' vaccine concerns is paramount.

“I have heard COVID-19 will make you infertile.” (FGA2)

This statement reveals a common concern about vaccine side effects, which has significantly contributed to vaccine hesitancy globally, as reported in several studies. It suggests a need for effective communication strategies to educate healthcare professionals about vaccine safety and potential side effects using evidence-based information. These adverse events were related to misinformation and fake news on social media. Other commonly reported adverse events include death within two years of vaccination, infertility after vaccination, and even amnesia. The fear of adverse events was linked to undue belief in natural immunity over vaccines and a lack of confidence in the government. This reflects a lack of trust in government policies, identified in research as a critical factor influencing vaccine acceptance. Governments' transparency and effective communication are crucial for building public trust and ensuring successful vaccine uptake, especially among healthcare providers, who are often role models for their patients and the general public.

Due to the potential adverse effects of vaccines, some dentists proposed better ways to prevent COVID-19 than using vaccines, such as maintaining physical distancing and using masks.

“My friend at work recently contracted COVID-19 from the vaccine. Vaccines are spreading COVID-19.” (FGB2)

The third category of vaccine hesitancy relates to the possibility of COVID-19 through vaccinations. Some research participants reported cases of friends and family members contracting COVID-19 even after vaccination. The statement presents a perspective highlighting a common misconception about COVID-19 vaccination: the notion that the vaccine can cause or spread the disease. The claim appears to stem from a personal anecdote, referring to a friend contracting the virus post-vaccination, which is conflated with the causal effect of the vaccine. This statement underscores the depth of misinformation or misunderstanding about the nature and function of vaccines. COVID-19 vaccines teach our immune systems how to recognise and fight the virus that causes COVID-19. They do not contain live viruses and, thus, cannot cause or spread the infection.

There are several reasons why someone might test positive after vaccination. Firstly, no vaccine is 100% effective, and breakthrough infections can occur, although they are typically less severe. Secondly, most vaccines require some time (up to two weeks after the second dose) to provide complete protection. Thus, if a person is exposed to the virus just before or after getting the vaccine, they could still contract and test positive for the virus.

The anecdotal nature of the claim ("my friend at work") reflects another common issue in health-related beliefs: personal experiences or stories often hold more sway than abstract statistics or facts despite not necessarily representing the broader reality. This emphasises the importance of clear, empathetic communication in public health messaging, including addressing individual concerns and experiences.

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Lastly, this statement signals potential mistrust in the scientific community or public health authorities, suggesting a broader challenge in building public trust and adherence to recommended public health measures. Health literacy, media literacy, and transparent communication from trusted sources become essential in this context.

"American and British companies are selling their vaccines for earning profit from third world countries." (FGC1)

The fourth category of the vaccine hesitancy theme is pharmaceutical companies influencing vaccine policies. Some regarded mandatory vaccination as a marketing strategy used by Western pharmaceutical industries to sell their products to third-world countries at higher rates. This statement expresses a belief that pharmaceutical companies from developed countries (specifically the US and UK) are exploiting the COVID-19 pandemic for profit, particularly in third-world or low-income countries.

It is critical to acknowledge that vaccine production is indeed a business for pharmaceutical companies, and they do seek a return on their research and development investments. Some pharmaceutical companies, such as Pfizer and Moderna (American), have generated significant revenues from their COVID-19 vaccines. AstraZeneca, a British-Swedish multinational company, has also sold its vaccine worldwide, although it pledged to provide it at cost during the pandemic.

However, the assertion that these companies are profiteering specifically from third-world countries might not be entirely accurate. Multiple initiatives have been undertaken to ensure equitable global distribution of vaccines. For instance, COVAX, led by the World Health Organization, GAVI, and the Coalition for Epidemic Preparedness Innovations (CEPI), aims to facilitate fair and equitable access to COVID-19 vaccines for every country, regardless of income level. Moreover, AstraZeneca has licensed its vaccine to the Serum Institute of India, enabling greater access in lower-income countries.

Despite these efforts, there is a significant disparity in vaccine distribution, with wealthier nations having more access than poorer countries. This global inequity is an issue that needs addressing. Still, it's less a direct result of profiteering by vaccine companies and more related to systemic problems in international health policy, global supply chains, and intellectual property rights.

The sentiment in the statement indicates mistrust and scepticism toward the intentions of pharmaceutical companies and possibly even toward the vaccines themselves. Such mistrust can undermine vaccination efforts and public health. Thus, it is essential to improve transparency in vaccine pricing, distribution, and intellectual property rights and communicate these matters effectively to the public.

"If vaccines are so effective, then how come vaccine companies are recommending booster doses now and then?" (FGD1)

The fifth and last category was the long-term efficacy of vaccines. The participants claimed that since these vaccines had not been tested in third-world countries, their effectiveness in our population is questionable. The statement reflects scepticism towards the need for booster doses of the COVID-19 vaccine, questioning their effectiveness and potentially attributing the recommendation for boosters to motivations other than public health. In assessing the validity of this scepticism, it's essential to understand the principles of vaccine science and the specific context of the COVID-19 pandemic. Vaccine effectiveness is typically measured by its ability to prevent or significantly reduce the severity of the disease in question. In the case of COVID-19, vaccines have been remarkably effective, substantially reducing severe disease, hospitalisation, and death across populations.

That said, the immune response to vaccination can wane over time, reducing protection. This phenomenon is not unique to COVID-19 vaccines; it is why booster doses are standard for many vaccines, such as tetanus or pertussis. Moreover, the COVID-19 situation is evolving, with new variants emerging. Some of these variants may partially evade the immunity provided by vaccination or natural infection, making booster shots a vital strategy to maintain a high level of immunity in the population.

Therefore, the recommendation for COVID-19 booster doses does not imply that vaccines are ineffective. Instead, it's a proactive measure to maintain their effectiveness amidst waning immunity and the emergence of new variants. Public health authorities

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and vaccine manufacturers must communicate these nuances clearly and transparently to counteract misconceptions and foster trust in vaccination efforts.

The qualitative component of the study adds depth to quantitative findings by revealing underlying beliefs and concerns, such as fear, mistrust, and perceived lack of resources. These themes are consistent with those found in qualitative studies among healthcare workers in other contexts; for example, a survey by Karasneh et al. (2021) found similar themes among dental professionals in Jordan, indicating shared concerns across different settings.[29]

In summary, this study's findings align with and contribute to the growing body of literature on healthcare professionals' knowledge, attitudes, and practices during the COVID-19 pandemic, shedding light on specific challenges and concerns within the dental fraternity.

This study has some limitations. The data collected is self-reported; thus, it is susceptible to recall bias and social desirability bias. Participants might have over-reported their knowledge, attitudes, or practices regarding COVID-19. However, the interviews have brought to light the richness of the experiences of the research participants. The study was conducted in Karachi, Pakistan, and therefore, the findings may not be generalised to dental professionals in countries with different cultural, socioeconomic, or health system contexts. The study is cross-sectional, and therefore it captures the knowledge, attitudes, and practices at a specific point in time. The responses might change as the situation evolves and more information about COVID-19 becomes available. This cross-sectional study could not assess how knowledge, attitudes, and practices might change over time as the pandemic progresses or as more information about COVID-19 is disseminated.

CONCLUSION

This study found that dental undergraduates and graduates had adequate knowledge of COVID-19. However, the majority did not practice the WHO guidelines adequately. Substantial awareness campaigns with rigid governance and policy can help curb this outbreak.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

Ethical approval was obtained from Sir Syed Dental College's Ethics Review Committee Ref. No. SSCMS/College/Principal (Dental)/2022/059.

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ORIGINAL ARTICLE

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The Conceptions of Learning: A Qualitative Analysis of Dental Students' and Teachers' Perspective at Hamdard University Dental Hospital

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ABSTRACT

Objectives: To identify learning and teaching conceptions in both students as well as teachers of Dentistry. The spectrum of students' and teachers' learning conceptions, presented in this study, is expected to help the teachers better understand their students' diversified requirements and hence select appropriate teaching strategies.

Materials and Methods: A questionnaire with consent and 5 open-ended questions constructed on google forms was distributed to undergraduate students of dentistry, postgraduate trainees, and faculty members. Qualitative analysis of participants' responses was performed following Association for Medical Education in Europe (AMEE) Guide No 131.

Results: The study participants' views about a good learner were mainly found to be teacher-centred. The undergraduate students were more expressive by using a wide range of words for their learning conceptions and expectations. The main teaching conceptions mentioned by the study participants were behaviour modification in addition to the spread of knowledge and facilitation. Teaching was considered an art and a noble profession by the student participants.

Conclusion: The range of conceptions about learning and teaching presented in the study, especially by the students, reinforces the need for the teachers to identify them periodically throughout the course. Relating students' conceptions with one's own and modifying the teaching strategies, accordingly, contribute to making an effective teacher.

Keywords: AMEE Guide, Metacognition, Teaching Conceptions, Learning Conceptions, Learning Preferences, Lifelong Learning

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INTRODUCTION

Learning is a constant and dynamic process.[1] Understanding the learning patterns and styles has always sparked keen interest among educationists and psychologists. The conception of learning is defined as a learner's ideas and beliefs about learning. Yokoyama and Miwa took an account of multiple studies on conceptions of learning and categorized them into three broad groups. Active conception is a process of learning influenced by the learner's intent to bring a positive change in self, passive conception that is influenced by external pressure, and experiential conception of learning that results from day-to-day experiences.[2]

McDonough[3] summarized their discussion on child and adult learning processes by bringing forward the important factors required for learning by both groups. These include a supportive environment, actual situations that bring about new learning, exhibiting material that presents new knowledge, personal interest, practical involvement in the process of learning, facilitation, responsibility towards learning, application of knowledge, feedback and combining new with prior knowledge and life experiences. The difference between child and adult learners brought forward by McDonough was that adults take the responsibility of utilizing the knowledge they already have and their practical experiences to continue goal-oriented learning. Whereas children learn through the same processes unknowingly from their environment.

The Association for Medical Education in Europe (AMEE) publishes guides for teachers in the health profession for professional development.[4] AMEE guide 83 discusses adult learning theories and categorizes them further into six sub-types. 1: Instrumental (behavioural, cognitive, and experiential), 2: Humanistic (andragogy and self-directed learning), 3: Transformative (critical reflection), 4: Social, 5: Motivational, and 6: Reflective models.[5]

Teaching conceptions are educators' opinions regarding what methods are effective and congenial and how they influence the level of participation of both students and teachers. The constructivist approach refers to a combined effort of student and teacher. This is done through active interaction in which the teacher facilitates the students by creating a conducive environment for learning, and the students construct newer knowledge and skills over what they already know.[6]

Shuell[7] keenly assessed the effects of cognitive psychology by discussing behavioural and cognitive conceptions of learning; its active or passive nature; and the role of previous knowledge. He further highlighted the teacher's role in the active participation of students in learning activities, considering their previous knowledge and how to form newer constructs on it.

While comparing critical thinking in Confucian learning conceptions and Western learning culture, Wai[8] found no significant difference between them. In Confucian education, critical thinking is a combination of, knowledge and skills judged responsibly through raising questions, exploring answers, and involving in discussion on self-reflection. Western critical thinking combines the upper three levels of Bloom's taxonomy namely, analysis, synthesis, and evaluation. In another study, Metacognition guides students in using different methods of learning according to the situation. Three terms related to metacognition need to be understood clearly. Deep metacognition entails finding out the truthfulness of the information by combining and testing what was already known with new knowledge and experience. Whereas memorization and practising repeatedly are components of surface metacognition. Facing problems in setting up and failing to display an organized information processing represents disorganisation.[9,10]

Vettori et al[11] evaluated the relationship between surface and deep metacognition with academic achievements in high school students and found a positive relationship between the two. Furthermore, the work of Amadhila and Guest[12] concluded that an effective teacher employs a student-centred and learning-oriented conception framework. Omar[13] investigated the influence of students' personality types on their learning styles and the role of active learning in the subject of preclinical surgery. He emphasized the incorporation of active teaching and learning methodologies along with self-evaluation by the teachers and students to achieve the objectives of the course.

Carlson[14] while discussing the importance of training of maxillofacial surgery postgraduate students in andragogy comments that an effective maxillofacial surgery teacher should not only practically demonstrate, explain, and rationalize various surgical techniques, but document their results as well. In addition to research conducted in the surgical procedures being performed, he/she should simultaneously carry out research in the continuously

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evolving field of teaching. Ross[15] highlighted the importance of educators' conceptions of teaching and learning in finding the disparities and guiding how to deal with them.

While agreeing with Carlson and Ross's views, a study was planned to identify learning and teaching conceptions in students as well as teachers of the Dental Section, Hamdard University Dental Hospital. The authors were not able to find any local research on this aspect. The spectrum of students' and teachers' learning conceptions, revealed in this study is expected to facilitate its recognition by the teachers, This local data highlights the importance of selecting teaching strategies that best match the students' diversified requirements in our society.

MATERIALS AND METHODS

A questionnaire-based study was conducted by the Oral & Maxillofacial Surgery department in collaboration with the Department of Research and Innovation, Hamdard University Dental Hospital, Karachi after the approval from the Ethical Review Board of Hamdard University (Ref: HCM&D/021/2023, dated 6th January 2023). All students from first to final year BDS (Bachelor of Dental Surgery), Postgraduate residents, and teachers from basic and clinical sciences consenting to participate were included in the study using a non-probability convenient sampling method.

A specially designed questionnaire with consent and 5 open-ended questions, was constructed on Google Forms.[16] A pilot study for validation of the questionnaire was conducted with 5 representatives from the undergraduate group, 1 from the postgraduate group and 2 from the faculty. The questionnaire was then distributed to undergraduate students of dentistry, postgraduate trainees, and faculty members. The questions asked were (1) What do you understand by the term "Teaching", (2) What do you understand by the term "Learning", (3) What do you hope to achieve as a teacher, (4) What do you hope to achieve as a learner, (5) In your opinion, what are the attributes of a Good Learner.

Qualitative analysis of participants' responses was performed following AMEE Guide No 131.[17] The text of the responses was examined by both authors simultaneously. Thematic analysis was performed after inductively extracting the codes from the text. Two authors analysed the data to cross-check codes extracted to avoid individual bias and missed codes. Microsoft Excel software was used for tabulation of the data and analysis.

RESULTS

The total number of participants, in our study, was 105. Table 1 shows the demographics of study participants. The qualities of a good learner mentioned by our participants included: keen-reader; self-motivated; critical-thinker; disciplined; hard-worker; tech-friendly; receptive; and having sharp memory.

Table 1: Socio-demographic variables of the study participants

Participants	N	Percentage (%)
First-year	10	67.60%
Second year	2	
Third year	29	
Final year	30	
Postgraduate	11	10.47%
Teacher	23	21.90%

DISCUSSION

Teaching and learning conceptions are the understandings of teachers regarding the preferred ways of teaching and student learning. One broad category of teaching and learning conceptions identified by Bilgin and Aykac[18] was that in which the teacher is the source and means of spreading knowledge and the students are passive receivers. The other category is where the students actively combine new and existing knowledge. These conceptions have a vital role in the choice of teaching strategies and student satisfaction. The purpose of the study was to explore teachers' as well as students' conceptions of teaching-learning and their expectations with the intent to improve teaching strategies and hence achieve student satisfaction and improved outcomes.

Qualities of good learners were searched on the websites of different educational institutes,[19,20] and were compared with those mentioned by the study participants. The attributes which were found lacking in the study participants' views were, self-reflection, collaboration, conflict resolution and knowing how and when to ask for help. A possible explanation would predominantly be a teacher-centred approach which is more frequently used in the study setting. The vocabulary lacking within the replies is mostly related to student-centred learning.

An interesting finding of the study was that the undergraduate students had more words describing

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Table 2 shows conceptions of learning from undergraduate students (first to final year), postgraduate students and faculty members.

Table 2: Conceptions of learning from undergraduate students (first to final year), postgraduate students and faculty members

Undergraduate Students	Postgraduate Students	Faculty
Gain something new, Acquiring knowledge and skill/ discovery	Gain something new, Acquiring knowledge and skill/ discovery	Gain something new, Acquiring knowledge and skill/ discovery
Knowledge shared by the teacher	Knowledge shared by the teacher	Behaviour modification
Clearing concepts		Application of knowledge
Learning from mistakes		Continuous process
Understanding		
Grooming self, Behaviour modification		
Memorization		
To be strong in failures and successes		
Change in perspective		
Courage to ask		
Becoming wiser and more communicable		
Experience of skills		
To be beneficial to the society		
New ideas and experiences		
Best response at the time of the exam		

Table 3 shows conceptions of teaching from undergraduate students (first to final year), postgraduate residents and faculty members.

Table 3: Conceptions of teaching from undergraduate students (first to final year), postgraduate students and faculty members

Undergraduate Students	Postgraduate Students	Faculty
Guidance	Providing information	Providing information
Application of knowledge	Spreading knowledge and skills	Facilitation understanding/ clearing concepts
Responsibility/Demanding profession	Behavioural conditioning	Engagement with learners/ Interactive process
Organizational skills	Engagement with learners/Interactive process	Authentic ideas
Providing information	Skill	Spreading knowledge
Facilitating understanding		Mentoring
Spreading knowledge and skills		
Nurturing minds		
Behavioural conditioning		
Engagement with learners/Interactive process		
Positive mindset		
Support		
Instruction		
Art		
Skill		
Occupation		
Noble profession		
Clearing queries		
Learning		
Religious profession		

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Table 4 shows Expectations of achievements as teachers by Faculty members and Postgradujate residents.

Table 4: Expectations of achievements as teachers by Faculty members and Postgraduate students

Share knowledge
Develop good communication skills in students
Facilitate students
Provide a uniform learning environment to all students
Teach clinical skills
Clear concepts
Motivate students/ Mentor
Create reading habits in students
Develop good communication skills in self
Inspire students
Good results/students' success
Keep learning
Respect
Students' satisfaction
Better student-teacher relationship
Intellectual nourishment
Implementation of new advancements in the subject

Table 5 shows participants' responses to their expectations as Learners.

Table 5: Participants' expectations as Learners

Undergraduate Students	Postgraduate Students	Faculty
Continuous learning	Learn something new every day	Become a better teacher
As good as mentors		Participate in research
Change		Successful
Positivity and Confidence		Skilful
Set goals and follow plans		Better income
		Role model
		Stay updated

learning as compared to the postgraduate residents and faculty. The conceptions of learning by postgraduate residents and teachers were mainly gaining knowledge and behaviour modification. The undergraduate students came up with ideas like courage to ask, to be beneficial to the society, best response at the time of exam and to be strong at times of failures and successes. A plausible explanation for this might be that these meanings of learning have already been incorporated in the minds of more mature learners which is why they are using broader terms as compared to the undergraduate students who are in their initial phase of learning in this profession. The final year students were much more expressive and vocal regarding their conceptions of learning and expectations of being a learner for example analytical, time management, creative thinking, teamwork, learning from mistakes, and behavioural change. The conceptions revealed in the present study very well fit into broad categories of learning conceptions by Yokoyama and Bilgin, namely active, passive and experiential.[2,18]

Interestingly, a significant relationship between students' epistemological beliefs namely "reflective learning, collaborative knowledge-building, valuing metacognition, certain knowledge, and practical value" with their learning conceptions and academic

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achievements has been presented by Lonka and coworkers.[21]

Dart et al[22] discussed three broad categories of learning conceptions namely "qualitative, quantitative and experiential". While investigating the relationship of learning approaches with learning conceptions, the qualitative and experiential conceptions were found to have a deep approach, while the quantitative conception utilized a surface approach. Umapathy et al[23] in their study on computer science students, concluded the students at a higher level of education predominantly utilize deep learning approaches by activating what is already known to develop new ideas. This infers that the teachers should design their methodologies addressing various types of students' preferences.

When the study participants were asked what they understood by the term teaching, the postgraduate residents and faculty responded by spreading knowledge, facilitating, and engaging with students and bringing about behavioural conditioning and modification. The undergraduate students had more words to explain teaching as the application of knowledge, an art and a skill. They consider teaching as a noble and religious profession. This represents students' expectations regarding their teachers. Ross[15] explained that none of the conceptions is better than the other rather it should be used appropriately according to the situation. He emphasized that a teaching conception appropriately matching the teaching situations, leads to the selection of an effective teaching methodology.

Deraney[24] in a survey performed on students of the education department, observed true translation of teacher-centred to student-centred conception. It highlighted the importance of a more interactive student-teacher relationship. In the study by Kenneth,[25] contributors to the making of a good teacher include a grip on the subject, teaching material, methodology, professionalism, a conducive environment, and priority to enhancing students' performance.

In this study, while answering about expectations as teachers, the responses of faculty members and postgraduate students considered as future teachers, include: providing a learning environment to students; achieving good student' results; improving communication skills; improving teacher-student relationships; and implementing new advancements in the subject. In an invited commentary in the field of medical education, Prober and Norden[26] emphasized that both the teacher and student to reconsider their roles. The teachers should conduct interactive sessions and develop critical-thinking in their students to make future leaders who will provide cost-effective and patient-centred healthcare to the community. Students have the responsibility to acquire essential knowledge upon which the healthcare profession is based and understand the importance of continuously updating their knowledge.

To regulate student learning, Allal[27] highlighted the importance of the combination of self-monitoring by the student, and monitoring by the teachers using interactive teaching methodologies, assessments, and peer feedback. Liebech and Sjølie[28] in their study, highlighted the importance of training the students for collaborative learning which prepares them for real-life scenarios. They also emphasized the role of teachers in designing their teaching that incorporates collaborative learning. Han and Ellis[29] bring forward the importance of discussion either face-to-face or online. They emphasized that just providing opportunities for discussions would not have a significant effect on learning unless the students are guided by the teachers on how to utilize this methodology in improving their learning by considering other participants' ideas and assessing their own. This requires the active participation of the teacher even before the actual discussion starts.

The current study found the expectations as learners changed with the experience level of the participants. The undergraduate and postgraduate students as learners were mainly concerned with continuous learning, setting goals, and following plans. Whereas the faculty members had a wider range of expectations as being skilful, role models, researchers, and having a realistic approach to having a good income. This trend is also expressed by Giordano and Porciúncula[30] in their study. They concluded that educators' teaching and learning conceptions change with experience which in turn brings about a change and improvement of teaching methodologies and hence influences their comprehension and grasp of the syllabus. Carlson[31] relates lifelong learning to self-authoring and self-transforming minds and emphasizes its role in medical education. The findings of the study presented, reinforce the need for the teachers to first understand their own beliefs and preferences for learning, realize the diversity of learning conceptions among their students, design and keep updating their teaching methodologies that best match

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the scenario they are dealing with. Omar[13] emphasizes on evaluation of students' learning conceptions and styles at the commencement of each year, reviewing the course, and regular feedback to make teaching effective.

The responses of faculty members were not assessed according to their level of experience, which may also influence their conceptions. Future research exploring this aspect is recommended. The study presented is just the tip of the iceberg. To explore more deeply, it is recommended to conduct regular evaluations of teaching and learning conceptions and feedback from students of each year as well as teachers during the Dentistry course and update the teaching strategies and methodologies according to it. Documenting and sharing these evaluations between related departments of different institutions is also recommended for professional enhancement.

CONCLUSION

A teacher should be a lifelong learner to bridge the gap between their expectations and those of the students and hence achieve better student satisfaction and results. Realization and recognition of students' conceptions and approaches to learning combined with understanding and improving one's own learning and teaching approaches, contribute to making an effective teacher.

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DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

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ORIGINAL ARTICLE

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Maintenance of Dental Hygiene in Various Brushing Practices Among Orthodontic Patients with Multi-Bracket Fixed Appliances

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ABSTRACT

Objectives: To determine the plaque index of orthodontic patients with multibracket fixed appliances in various brushing practices.

Materials and Methods: This cross-sectional study was conducted at the orthodontic department of a tertiary care hospital. The inclusion criteria were patients, aged 15-30 years, of both genders who receive at least six months of treatment with multi-bracket fixed appliances. The patients with restored teeth, mental incompatibility and craniofacial syndromes/anomalies were placed in exclusion criteria. Silness and Loe index for plaque were recorded for each patient. Independent sample t-test and One-way ANOVA were applied to determine the difference in plaque scores for various brushing practices. The level of significance was set at less than or equal to 0.05.

Results: The gender distribution of the study sample came out to be 36.9% males and 63.1% females. Statistically significant differences in plaque scores for the variables like the method of brushing (p = 0.02), practice of brushing (p = 0.009) and timing of brushing (p = 0.001) were seen. Post hoc Bonferroni test showed a statistically significant difference between the variables like once per day and twice per day (p = 0.018), once per day and more than twice per day (p = 0.040) and before breakfast and after breakfast (p = 0.001).

Conclusions: The use of interdental brushing in addition to normal brushing and mouthwash produces minimal improvement in plaque reduction. The male and female subjects comply equally with oral hygiene measures. Brushing twice a day after breakfast and before going to bed significantly reduces plaque in orthodontic patients.

Keywords: Brushing practice, Oral Hygiene, Multibracket appliances

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INTRODUCTION

Dental plaque accumulation is associated with many diseases of the tooth and surrounding periodontium. These diseases range from white spot lesions of teeth to more advanced tooth decay which ultimately results in loss of teeth.[1] The periodontium also suffers from the hostile environment produced by the microorganism embedded in dental plaque with sequential development of gingivitis, periodontitis and finally loss of the attachment apparatus of the tooth.[2] To prevent the accumulation and hazards of dental plaque brushing has been advised for every individual at least twice a day.[3] Various types of brushes have been devised for brushing purposes like manual, electric and interdental.[4] Despite brushing frequency and techniques plaque accumulates on the teeth due to the complexity of morphology of the dental and peridental tissues. The presence of orthodontic appliances especially the multibracket fixed appliance further complicates the situation and makes the cleaning of teeth much difficult.[5,6]

The efficacy of various methods and practices in preventing dental plaque formation and improving oral hygiene has been evaluated in various ways by investigators.[7-9] Some have evaluated the efficacy of manual and electric tooth brushes.[10,11] Others have evaluated the difference between written instruction and verbal instructions for oral hygiene maintenance.[12,13] The use of interdental tooth brushes and high-pressure water jet cleaning of the teeth has been also investigated. These studies show variable results regarding the use of different types of brushing methods and brushes.[13,14] Some have shown electric brushes to be superior to manual brushes for maintaining dental hygiene while others have shown no difference. Ariane et al[13] have shown an improved efficacy of the interdental brush in patients with lingual brackets. They further concluded that both verbal and written instructions play a major role in oral hygiene improvement.

After the placement of multi-bracket fixed appliances in orthodontic patients, the regular instructions are brushing twice daily, one after breakfast and the other before going to bed at night. The use of interdental brushing is also advised in patients who find it difficult to clean with regular brushing. Verbal instructions are the usual mode; however, some centres also give written instructions to their patients. The compliance of the patients with all the instructions may vary and therefore, the oral hygiene maintenance may be different. The research done about white spot lesions, dental caries and periodontal disease consequently to orthodontic treatment shows that oral hygiene measures do not suffice to prevent them.[16] Therefore, we have designed this study to determine the plaque levels in our orthodontic patients with multi-bracket fixed appliances following the oral hygiene maintenance instructions. This will provide the necessary information to further modify the oral hygiene instructions and evaluate them for their efficacy.

MATERIALS AND METHODS

This cross-sectional study was conducted after ethical approval from the institutional review board of prime foundation Pakistan (Prime/IRB/2021-377) at the orthodontic department of a tertiary care hospital from January to June 2022. The inclusion criteria were patients, aged 15-30 years, of both genders who receive at least six months of treatment with multi-bracket fixed appliances. The patients with restored teeth, mental incompatibility and craniofacial syndromes/anomalies were placed in exclusion criteria. A total of 130 patients during the 6 months gave written consent before inclusion in the study. Silness and Loe index[5] for the plaque were recorded for each patient. Six teeth (21, 26, 15, 31, 46 and 35) from all the quadrants were selected for recording plaque index. The plaque scores were recorded as the absence of plaque (grade 1), mild plaque revealed with dental explorer (grade 2), moderate plaque accumulation along the gingival margin visible to the eye (grade 3) and substantial soft debris with gingival margin and braces (grade 4). The final plaque score for subjects was obtained by dividing the summed-up plaque score of all six teeth by six. The measurement errors were ruled out by inter-examiner assessment of plaque scores of randomly selected twenty subjects.

The data were analyzed by SPSS for Windows (version 20, Chicago Inc.). The plaque scores for gender, use of mouth wash and method of brushing having two variables were assessed with an Independent sample t-test. The difference in plaque levels for practice and timing of brushing having three variables were assessed with One-way ANOVA and Post Hoc Bonferroni tests. The intra-examiner reliability was assessed by Kappa statistics. The level of significance was set at less than or equal to 0.05.

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RESULTS

The gender distribution of the study sample came out to be 36.9% males and 63.1% females. The difference in plaque index between variables like method of brushing, use of mouth wash and gender of subjects is shown in Table 1. The variable of the brushing method ($p = 0.02$) showed a statistically significant difference while the variables like the use of mouthwash and gender were insignificant.

The difference in plaque scores for variables like practice and timing of brushing is shown in Table 2. A statistically significant difference was seen for the variables like practice of brushing ($p = 0.009$) and timing of brushing ($p = 0.001$). The Post hoc Bonferroni test showed a statistically significant difference between the variables like once per day and twice per day ($p = 0.018$), once per day and more than twice per day ($p = 0.040$) and before breakfast and after breakfast ($p = 0.001$). The agreement of the first and second examinations at 70.3% for plaque scores gives a Kappa value of 0.68 which is indicative of good inter-examiner reliability.

Table 1: Comparison of plaque index regarding method of brushing, use of mouthwash and gender

Variable		N	Plaque Index Mean ±SD	*p*-value
Method of brushing	Normal brushing	91	1.53 ±.62	0.020*
	Interdental brushing	39	1.26 ±.53	
Use of mouthwash	Yes	31	1.28 ±.52	0.076
	No	99	1.51 ±.63	
Gender	Male	48	1.53 ±.62	0.374
	Female	82	1.42 ±.61	

N = 130
Independent sample t-test
*Level of significance ≤ 0.05**

Table 2: Comparison of plaque index regarding practice and timing of brushing

Variable		N	Plaque Index Mean ±SD	*p*-value
Practice of brushing	Once per day	38	1.71 .53	0.009*
	Twice per day	75	1.37 .63	
	>Twice per day	17	1.27 .54	
Timing of brushing	Before breakfast	76	1.62 .60	0.001*
	After breakfast	50	1.22 .56	
	Before bed	4	1.31 .34	

One-Way ANOVA
*Level of significance ≤ 0.05**

DISCUSSION

Esthetics, functional occlusion and stability are the prime objectives of orthodontic treatment. However, to guard these objectives before, during and after orthodontic treatment the importance of oral hygiene maintenance cannot be overlooked. If compromised, bad oral hygiene can leave the teeth and supporting structures in miserable conditions which subsequently will jeopardize the prime objectives of esthetics, functional occlusion and stability. There are several factors which are responsible for maintaining oral health in optimal condition. Among these, the most important are the brushing practices, eating habits, use of mouthwash and scheduled ultrasonic scaling. In this present study, we have placed our focus on the brushing practices of orthodontic patients to evaluate how well the various factors contribute to maintaining oral

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hygiene at an optimal level.

The investigation of the brushing practices has produced promising results to comprehend their use. The present study shows that the use of an interdental brush, when used in addition to normal brushing, results in a significant reduction of plaque levels and achieves optimal cleanliness in patients with multi-bracket fixed appliances. Dissimilar findings were shown by other studies in which the interdental cleaning devices were investigated.[13-15] Their results have shown that interdental cleaning devices although can reduce plaque levels, do not produce significant differences. The use of mouthwash to keep the level of plaque as low as possible during orthodontic treatment has been also investigated. In the present study, we have found a decreased level of plaque accumulations in subjects who have used mouthwash during the orthodontic treatment. However, the difference was not significant from those subjects who had not used mouthwash. Similar results have been reported by another study carried out to see the effect of mouthwashes in reducing the risk of white spot lesion formation in orthodontic patients.[1,9,17] Although mouthwashes do not produce a significant difference in the reduction of plaque levels, their role in subjects with poor and compromised patients will become much more significant. The plaque levels were also seen for the gender of the subjects in the present study. Both were equally compliant with oral hygiene instructions as there was no significant difference in plaque levels between male and female subjects. On the contrary, other studies showed better compliance with instructions from female subjects on improving oral hygiene as compared to the male subjects.[18-20]

The timing of brushing is very important in keeping oral hygiene at an optimal level. The timing and frequency of brushing have been investigated by other researchers[21,22] in terms of the percentage of the subjects however, the difference in plaque level based on these various brushing practices has not been determined by any researcher. In the present study, we have found a significant reduction in plaque development in subjects who brush their teeth after breakfast as compared to those who brush before breakfast. The subjects who brush their teeth before going to bed at night are very few which is why this finding does not produce a significant difference. The frequency of brushing was also determined in the present study. The subjects who brush their teeth twice a day were shown to have significantly reduced plaque levels as compared to those who brush once a day. However, no significant difference was seen for the subjects who brush their teeth more than twice a day. So, brushing more than twice a day may be harmful to the supporting gingiva of the dentition rather than having some beneficial impact.

The orthodontic patients need careful monitoring for oral hygiene during treatment with the appliances in the mouth for a long time. For this reason, apart from setting the objectives of esthetics, stability and functional occlusion, the factors for better oral hygiene of the patients must be carefully considered. Ignoring these factors may lead to a complete failure of all the treatment objectives as poor health of teeth and supporting structures may call for halting the process altogether. Limitations of the study are the confounding factors like socioeconomic status and dietary habits of the patient which are not addressed. The results of this study showed that verbal instructions and measures to maintain oral hygiene are not sufficient. Therefore, additional measures like dietary advice, frequent scaling and extra sessions for oral hygiene counseling etc. are needed to be incorporated and evaluated with the help of research to improve oral hygiene and prevent the dental and periodontal disease process during and after orthodontic treatment.

CONCLUSIONS

The use of interdental brushing in addition to normal brushing and mouthwash produced minimal improvement in plaque reduction. The male and female subjects comply equally with oral hygiene measures. Brushing twice a day i.e. after breakfast and before going to bed significantly reduces plaque in orthodontic patients.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

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AUTHORS CONTRIBUTION

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ORIGINAL ARTICLE

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Comparison of Flouride Varnish and Gluma Desensitizer in the management of Dentinal Hypersensitivity

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ABSTRACT

Objectives: Fluoride varnish and Gluma desensitizer have both been used to treat dentinal hypersensitivity and Gluma desensitizer was found more effective than Fluoride varnish. This present study aimed to compare fluoride varnish and Gluma desensitizer in the treatment of dentinal hypersensitivity using a Visual Analogue Scale (VAS).

Materials and Methods: This cross-sectional study was conducted in the Department of Operative Dentistry, Pakistan Institute of Medical Sciences, Islamabad from November 2021 to May 2022. Using a non-probability consecutive sampling technique, sixty patients were included in the study. The total subjects were randomly divided into two groups, group A was to signify Gluma Desensitizer (Heraeus Kulzer, Hanau, Germany) and group B was to signify fluoride varnish (Duraphat, Colgate Oral Pharmaceuticals, New York). After the procedure, patients were clinically evaluated for pain in response to thermal, tactile and air stimuli on VAS at baseline and after 01 months.

Results: Amongst the chosen subjects, 25 years was the minimum age while 70 years was the maximum age with a mean ± standard deviation of 45.18±15.59 years. By using an independent sample t-test, it was observed that effect modifiers like age and gender were not statistically significant at the starting point, but it was statistically significant after treatment for both groups A and B.

Conclusion: Based on the evidence-based findings of the present study, it is concluded that Gluma desensitizer was better at controlling dentinal hypersensitivity than fluoride varnish.

Keywords: Dentinal Hypersensitivity, Fluoride Varnish, Gluma Desensitizer

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INTRODUCTION

The most commonly encountered dental problem these days is dentine hypersensitivity (DHS) which is regarded as sharp pain resulting from exposure of dentine to tactile, chemical, osmotic or thermal stimuli in the absence of any other pathology or dental defects.[1] Dentine hypersensitivity might be present on several teeth or specific teeth within the same quadrant of the mouth.[2]

DHS must be distinguished from the sensitivity caused by other conditions such as fractured restorations, caries, cracked tooth syndrome or microleakage. Multiple treatment options are available, yet the clinical management of DHS is challenging, and its success highly depends on a thorough dietary history along with a detailed clinical examination.[3]

Canadian Advisory Board on DHS (2003) suggests the use of the term "disease" as an alternative to the term pathology. This definition identifies DHS as a distinct entity and provides a clinical descriptor of the condition so that it inspires the clinician to explore other possible causes. Meanwhile, the clinician should be able to exclude all other possible causes of pain, as many other conditions are well known to cause dentinal pain before going on with any other treatment modalities of DHS because these conditions might require different treatment possibilities which are different for the treatment of DHS. There are many conditions included in DHS such as marginal leakage of restorations, chipped enamel, cracked cusps of teeth, fractured restoration, and even palate-gingival grooves and caries.[3,4]

The condition of DHS is related to a diversity of exogenous stimuli such as evaporative, chemical (acid exposure), osmotic changes (sweets or drying the surface), tactile (touch) or thermal (cold).[4,5] Many significant variations exist in the extent of dentin hypersensitivity as well as in the degree that might be different from one another individual governed by the differences in state of pulpal health, exposed dentinal tubule, differences in pain tolerance, environmental factors and emotional state of that individual. These conditions could affect any tooth but mostly affect the premolars as well as the canines.[5,6] In the 1860s, scientific investigations of tooth hypersensitivity began but currently the most widely accepted theory is a hydrodynamic theory which states that painful symptoms are generally related to the fluid movement within the pulp-dentin complex. Hypersensitivity and dentin exposure is a result of extensively open dentinal tubules that respond to mechanical, chemical or thermal stimuli.[7]

Dentin exposure can be caused by aggressive tooth brushing, inappropriate diet, gingival recession secondary to periodontal disease or occlusal disharmony. Previous treatments aimed at sealing the patent dentinal tubules with agents such as topical fluoride reducing their permeability of the tubules thereby resulting in decreased DHS.[8,9] This study aimed to compare fluoride varnish and Gluma desensitizer in the treatment of dentinal hypersensitivity using a visual analogue scale. The rationale of this study is that finding what treats dentinal hypersensitivity better will help in the management of patients dealing with hypersensitivity-related problems. It will help improve the quality of dental treatment provided to the patients.

MATERIALS AND METHODS

This prospective clinical study was carried out in the Department of Operative Dentistry, Pakistan Institute of Medical Sciences, Islamabad from November 2021 to May 2022. The sample size, as calculated by the WHO calculator was 30 subjects in each group – one group being treated by Fluoride varnish and the other by Gluma desensitizer. A consecutive, non-probability sampling technique was used.

Both males and females between the ages of 25-70 years were included in the study. These subjects had long-standing sensitivity to cold, heat, sweet/sour or touch in their premolars. Clinical examination showed gingival recession with the exposure of cervical dentine in the premolars of these patients. Signs of moderate to severe abrasion, erosion or attrition were also observed. However, individuals with an immunocompromised condition or on immunosuppressant medications, pregnant females, those who received any prior desensitizing therapy, individuals with multiple carious teeth and extensive restorative work, those with other pulpal or periodontal painful conditions, handicapped, and individuals who underwent any periodontal surgery within last three months were excluded from the study.

This study was conducted after the approval of the institutional ethic review committee. The objective and

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importance of this study were explained to the patients, and they were assured of no risk involved while being a part of this study. A written consent was taken from each patient. A validated performa was designed to record the findings of the study. A total of sixty subjects were randomly divided into two groups using computer-generated grouping. Group A was to signify Gluma Desensitizer (Heraeus Kulzer Hanau Germany) and group B was to signify Fluoride Varnish (Duraphat, Colgate Oral Pharmaceuticals, New York).

Before recording each subject's response to stimuli, their teeth were isolated using cotton rolls and were cleaned using a cotton pellet. Pain to different stimuli was recorded using Visual Analogue Scale (VAS). A three-way dental unit syringe was used to direct compressed air from a distance of approximately 2 cm for 5 seconds. Cold stimulus i.e., an ice stick was touched on the facial surface of the teeth for 5 seconds and the response of the patient was noted. The tactile stimulus was recorded using a WHO periodontal probe by dragging it vertically and laterally over the exposed facial surface of the teeth.

After a baseline pain assessment was carried out, the teeth of concern were isolated using cotton rolls. Fluoride Varnish (Duraphat) and Gluma Desensitizer were applied on the premolars (test teeth) of respective groups according to the manufacturer's instructions. Gluma Desensitizer (Heraeus Kulzer Hanau Germany) was applied to the patients in Group A. The Tooth under consideration was cleaned using a prophylactic paste, vigorously rinsed with water and then air dried. The tooth was then conditioned using Gluma Etch 20 Gel for a total of 20 seconds. It was then rinsed, air dried and finally moistened again using pellets damped in distilled water. A disposable brush applicator was used to apply Gluma Comfort Bond Plus Desensitizer to the patients in group A. An additional coat of the desensitizer was applied, and light cured for 15 seconds. On the other hand, Duraphat (Colgate Oral Pharmaceuticals, New York) was applied to the sensitive teeth in Group B. Just as in group A, each sensitive tooth was cleaned using a prophylactic paste, thoroughly rinsed with water and air dried. A disposable brush applicator was used to apply a thin film of Duraphat, followed by an additional coat that was applied after 5 minutes. After the procedure, the patient's response to pain was clinically evaluated using VAS by application of thermal, tactile and air stimuli at baseline and after 1 month.

Data were analyzed using SPSS 21.0. Descriptive statistics were applied to calculate the mean and standard deviation for the quantitative variables like age and pain scores of the patients. Frequencies and percentages were calculated for the qualitative variables like gender. An Independent sample t-test was used. *P*-value < 0.05 was considered significant. Effect modifiers like age and gender were controlled by stratification.

RESULTS

Among the subjects of the study, the minimum age was 25 years while the maximum age was 70 years with a mean ± standard deviation of 45.18 ± 15.59 years. There were 56.7% male and 43.3% female patients. The minimum and maximum score of dentinal hypersensitivity at baseline in Group A (Gluma desensitizer) can be seen in Table 1.

The minimum and maximum score of dentinal hypersensitivity at baseline in Group B (fluoride varnish) can be seen in Table 2.

By using an independent sample t-test, it was observed

Table 1: Descriptive Statistics of Group A (Gluma desensitizer) n=30

	Minimum	Maximum	Mean	Std. Deviation
Dentinal Hypersensitivity at baseline	5	10	7.57	1.19
Dentinal Hypersensitivity after 1 month	0	4	1.70	1.24

Table 2: Descriptive Statistics of Group B (fluoride varnish) n=30

	Minimum	Maximum	Mean	Std. Deviation
Dentinal Hypersensitivity at baseline	4	10	7.13	1.61
Dentinal Hypersensitivity after 1 month	2	5	3.57	0.82

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Table 3: Stratification of Dentinal Hypersensitivity at baseline with respect to Age (n = 60)

Age	Group	n	Mean ± SD	*p*-value*
< 48 years	Group A	18	7.56 ±1.29	0.263
	Group B	16	7.00 ± 1.55	
≥ 48 years	Group A	14	7.50 ± 1.23	0.343
	Group B	12	6.92 ± 1.83	

**Independent t-test*

Table 4: Stratification of Dentinal Hypersensitivity after 1 month with respect to Age (n = 60)

Age	Group	n	Mean ± SD	*p*-value*
< 48 years	Group A	18	1.94 ±1.31	0.001
	Group B	16	3.69 ± 0.79	
≥ 48 years	Group A	14	1.57 ± 1.09	0.001
	Group B	12	3.58 ± 0.99	

**Independent t-test*

that there was no significant association found in both groups of dentinal hypersensitivity at baseline having a *p*-value of 0.242.

When the independent sample t-test was applied it was observed that there was a significant association found in both groups of dentinal hypersensitivity after one month having a *p*-value of 0.001. The independent sample t-test was used to see the significance in both groups after the stratification of age and it was found that there was no significant difference between Group A and Group B at baseline having a *p*-value of 0.263 in < 48 years of age group. Whereas there was no significant difference was found in both groups having a *p*-value of 0.343 in ≥ 48 years of age group (Table 3)

By using an independent sample t-test and stratification of age, there was a significant difference found after one month between Group A and Group B having a *p*-value of 0.001 in the < 48 years of age group. There was a significant difference was found in both groups i.e. A, and B had *p*-values of 0.001 in the ≥ 48 years of age group (Table 4).

There was no significant difference found at baseline between Group A and Group B with *p*=0.263 in males and *p*=0.611 in females. When an independent T-test was applied, there was a significant difference found after one month in Group A and Group B with *p*=0.01 in both genders.

DISCUSSION

Dentinal hypersensitivity is a common condition that poses a significant challenge in dental practice, affecting a substantial portion of the population worldwide. The present study aimed to compare the effectiveness of fluoride varnish and Gluma desensitizer in managing dentinal hypersensitivity. Our findings contribute valuable insights into the potential treatment options available for dental professionals to alleviate patient discomfort and enhance their quality of life.

The results of this study demonstrate that both fluoride varnish and Gluma desensitizer were effective in reducing dentinal hypersensitivity compared to baseline levels. These outcomes are in line with previous research, supporting the use of fluoride varnish and Gluma desensitizer as viable treatments for dentinal hypersensitivity.[10,11] The mechanisms of action for these two treatments differ, but they ultimately lead to the occlusion of dentinal tubules, reducing nerve stimulation and sensitivity.

Notably, Gluma desensitizer exhibited a rapid reduction in hypersensitivity symptoms compared to fluoride varnish. This finding is consistent with studies that have reported the immediate relief provided by Gluma desensitizer due to its ability to create a protective barrier over exposed dentin.[12,13] On the other hand, fluoride varnish requires multiple applications over time to achieve comparable results. This delayed onset

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of action may be attributed to the gradual release of fluoride ions into the tooth structure, which helps to remineralize and desensitize the dentin.[14]

Despite the quick relief offered by Gluma desensitizer, its long-term efficacy appeared to decline over time. This decrease in effectiveness is likely due to the gradual wear and degradation of the protective barrier formed by the desensitizer, leading to the re-exposure of dentinal tubules. In contrast, fluoride varnish demonstrated a more sustained reduction in dentinal hypersensitivity. Studies have shown that fluoride varnish can provide long-lasting relief by promoting remineralization and strengthening the tooth structure.[15,16]

It is important to consider patient preferences and ease of application when choosing between fluoride varnish and Gluma desensitizer. In our study, patients generally found the application of fluoride varnish to be more comfortable and less time-consuming compared to Gluma desensitizer. Similar findings have been reported by others, indicating higher patient acceptability for fluoride varnish.[17,18] The simplicity of fluoride varnish application may enhance patient compliance, which is essential for successful long-term management of dentinal hypersensitivity.

However, this study has some limitations that should be acknowledged. Firstly, the sample size was relatively small, which may have influenced the statistical power and generalizability of the results. Future research with larger and more diverse populations is warranted to confirm these findings. Additionally, the follow-up period in this study was relatively short-term, and investigations with extended observation periods are needed to assess the long-term effectiveness and durability of both interventions.

CONCLUSION

In conclusion, our study demonstrates that both fluoride varnish and Gluma desensitizer are effective in managing dentinal hypersensitivity. Gluma desensitizer provides rapid relief, whereas fluoride varnish offers a sustained reduction in sensitivity over time. Considering patient preferences and ease of application, fluoride varnish may be considered a more favourable treatment option for dentinal hypersensitivity in dental practice. However, further research is necessary to explore a combination of both treatments and their long-term outcomes in a larger, more diverse population.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

The ethical approval is provided by the Research Ethics Committee at the School of Dentistry, Pakistan Institute of Medical Sciences, Islamabad, Pakistan

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Comparison of Carbamazepine Alone and in Combination with Gabapentin as Medical Therapy to Control Pain Associated with Trigeminal Neuralgia

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ABSTRACT

Objective: To investigate mean pain scores in patients of trigeminal neuralgia treated with Carbamazepine alone and in patients given combination therapy of Carbamazepine with Gabapentin after 4 weeks of starting therapy.

Materials and Methods: A prospective clinical study was undertaken at the Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry, Rawalpindi from July 2019 to March 2020. The first group received 100 mg of Carbamazepine twice daily and the second group received 100mg of Carbamazepine along with 300mg of Gabapentin twice daily. The patient was instructed to grade the intensity of pain on the Visual Analogue Scale (VAS) every week for four weeks after initiation of therapy. Mean pain scores for the week were calculated and compared.

Results: A total of 80 respondents were recruited with a mean age and standard deviation was 48.69 ± 11.8 years. A comparison of the mean VAS score of 3rd week in both groups revealed that there was a significant difference (p<0.001). Similarly, by week four, the difference between VAS scores of Groups A and B differed significantly (p=0.007). Age and gender did not significantly impact the postoperative VAS pain score at four weeks of follow-up.

Conclusion: The combination of Carbamazepine with Gabapentin resulted in better pain control in patients with trigeminal neuralgia as compared to Carbamazepine. Mean VAS score after 4th week in both groups Group A (Carbamazepine alone), and Group B (Carbamazepine plus Gabapentin), it was found that there was a significant difference between both groups and a significantly lower mean pain score was found in Group B as compared to Group A.

Keywords: Carbamazepine, Gabapentin, Trigeminal Neuralgia

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INTRODUCTION

Trigeminal neuralgia is a condition known for causing severe neuropathic pain. The disease's ability to cause such severe pain leads to a halt in everyday activities like talking, eating, drinking and touching the face. It also affects the psychological, social and physical needs of the individual.[1] Trigeminal neuralgia not only affects life on a social level, but it also produces serious mental health effects. As highlighted by an epidemiological study, the mental health effects of the condition include increased mood swings, depression and inadequate sleep.[2] The disease's nature is such that it is manageable by surgical, medical and dental healthcare professionals, hence there are different variations in its treatments which eventually leads to a delay in the access of specialist care.[3] Therefore, prompt and accurate treatment is required to curb the intense pain caused by the condition.

At present, drugs can be used for nerve block, and then, neurotomy, microvascular decompression, or radiofrequency thermocoagulation can be used for treatment, but available treatments are still far from the ideal effect and pain tends to recur.[4,5] Carbamazepine is the first choice for the treatment of primary trigeminal neuralgia, and it is effective for most patients, but it has many adverse reactions; blood routine, electrolytes, and liver and kidney functions should be monitored during medication.[6]

Gabapentin has been used in clinics for more than 10 years as a new type of anti-epileptic drug. Its good curative effect for neuropathic pain has been reported in many literature studies.[7,8] Primary trigeminal neuralgia is also a neuropathic pain in mechanisms. At present, many randomized controlled trials (RCTs) comparing the safety and efficacy of gabapentin and carbamazepine for primary trigeminal neuralgia have been carried out. Whether carbamazepine alone or in combination with gabapentin can be used as a medical therapy for pain associated with trigeminal neuralgia has not been verified by evidence-based research. This study aimed to assess the effect of these two drugs alone or in combination for the management of TN, to provide evidence-based medicine for medical practice.

MATERIALS AND METHODS

This prospective clinical study was undertaken at the Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry, Rawalpindi from July 2019 to January 2020. Permission was taken and already submitted by the Ethical Committee of the Armed Forces Institute of Dentistry for the study.

A consecutive sampling technique was used for the recruitment of patients. With the help of the WHO sample size calculator following are the calculations; Power: 80% Alpha: 0.05 Group I mean and standard deviation: 2.67 ± 0.95 Group II mean: 2.40 ± 0.86 Sample size: n: 80 (40 each group).

All patients who were recently diagnosed with trigeminal neuralgia who had not received any medical therapy for the disease were included irrespective of gender aged between 30 to 70 years. Pregnant women, nursing mothers and those with long-term history of trigeminal neuralgia which was refractory to treatment or those with compromised medical status were excluded from the study.

An informed written consent of the patients was obtained on consent forms after explaining the significance of the study. Demographic details (including name, age, gender, and contact) were obtained and recorded on specific Data Collection Forms. The patients were selected according to inclusion criteria and studied using a random controlled design and were randomly allocated as patients with odd registration numbers were assigned to the first group receiving 100 mg of Carbamazepine twice daily and patients with even registration numbers were assigned to the second group receiving 100 mg of Carbamazepine along with 300mg of Gabapentin twice daily irrespective of the gender and age. The patient was instructed to grade the intensity of pain on the Visual Analogue Scale (VAS) as 1 – No pain; 2 – Just notable pain; 3 – Weak pain; 4 – Moderate pain; 5 – Severe pain every week for four weeks after initiation of therapy. The mean of pain scores for all the whole week was calculated and compared.

Data was analyzed using statistical software SPSS version 25. Descriptive statistics were used to analyze Qualitative and Quantitative variables. Quantitative variables like age and pain score of 4 postoperative weeks were measured as mean ± Standard deviation (SD). Qualitative variables like Gender were measured as frequency and percentage. Independent sample t-test (Student t-test) was applied to compare quantitative variables like age and pain score of 4 postoperative

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weeks between 2 groups. *P* value ≤ 0.05 was significant. Stratification was done to control effect modifiers like age and gender. Post-stratification independent sample t-test was applied for quantitative variables like age and pain score of 4 postoperative weeks. *P* value ≤ 0.05 was significant.

RESULTS

A total of 80 respondents were recruited with a mean age and standard deviation was 48.69 ± 11.802 years. Males were 42/80 (52.5%) while females were 38/80 (47.5%) as shown in Table 1.

Table 1. Demographics and VAS Pain Score of the Participants

Age	48.69 ± 11.8
Age groups	
<50 years	46 (57.5%)
>50 years	34 (42.5%)
Gender	
Male	42 (52.5%)
Female	38 (47.5%)
VAS Pain score	
1st week	3.84 ± 0.88
2nd week	2.83 ± 0.81
3rd week	2.43 ± 0.84
4th week	1.86 ± 0.88

A comparison of the mean VAS score of 3rd week in both groups revealed that there was a significant difference (p<0.001). Similarly, by week four, the difference between VAS scores of Groups A and B differed significantly (p=0.007) as shown in Table 2.

The minimum mean VAS Pain score after 1st week was 2 and the maximum was 5 with mean and standard deviation as 3.84 ± 0. 878. The minimum VAS Pain score after 2nd week was 2 and the maximum was 4 with mean and standard deviation as 2.83 ± 0.808. The minimum VAS Pain score after 3rd week was 1 and the maximum VAS Pain score after 3 weeks was 4, with mean and standard deviation as 2.43 ± 0.839. The minimum VAS Pain score after 4th week was 1 and the maximum was 4 with mean and standard deviation as 1.86 ± 0.882 (Figure 1).

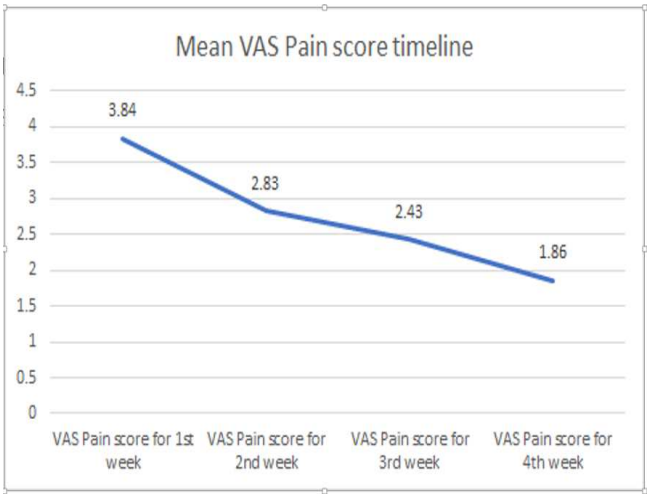

Figure 1: Mean VAS Pain Score

As shown in Table 3, age and gender did not significantly impact the postoperative VAS pain score at four weeks of follow-up.

Table 2: Comparison of mean VAS in both groups

VAS Pain Score	Group A (n=40)	Group B (n=40)	*p*-value
VAS Pain score for 1st week	3.85 ± 0.893	3.83 ± 0.874	0.9
VAS Pain score for 2nd week	2.93 ± 0.859	2.73 ± 0.751	0.271
VAS Pain score for 3rd week	2.75 ± 0.840	2.10 ± 0.709	0.001
VAS Pain score for 4th week	2.13 ± 0.992	1.60 ± 0.672	0.007

Table 3: Association of VAS pain scores at 4th week with age and gender

Parameter	Group A	Group B	*p*-value
Age			
< 50 years	2.13 ± 1.058	1.52 ± 0.730	0.082
> 50 years	2.12 ± 0.928	1.71 ± 0.588	0.132
Gender			
Male	1.96 ± 0.976	1.42 ± 0.507	0.073
Female	2.35 ± 0.996	1.76 ± 0.768	0.064

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DISCUSSION

The objective of the present study was to investigate mean pain scores in patients of trigeminal neuralgia treated with Carbamazepine alone and in patients given combination therapy of Carbamazepine with Gabapentin after 4 weeks of starting therapy.

It was found that there was a significant difference between the two therapeutic groups with respect to VAS score at 3rd and 4th week of treatment. Age and gender did not significantly affect the efficacy of the treatment.

Killian et al (1968) reported the effect of carbamazepine on 24 patients randomized in two groups. One group of patients were given carbamazepine titrated to a sufficient dose (maximum dose not stated) and the other group had a placebo.[9] A definite response (eg, disappearance or decrease of pain) was found in patients who took carbamazepine, whereas minimal to no response was reported in patients who took a placebo.

Yuan et al (2016) reported the effect of carbamazepine gabapentin in a meta-analysis of 14 RCTs including 1156 patients, one group of patients was administered gabapentin up to 3600 mg and the other group was given carbamazepine up to 2400 mg.[10] It was noted that patients of both groups responded similarly to both gabapentin and carbamazepine (odds ratio 1·6 [95% CI 1·2 to –2·2], p=0·002). A total of 170 (26%) patients in the gabapentin group and 306 (48%) patients in the carbamazepine group had similar side-effects, namely vertigo, somnolence, nausea, and fatigue.

Hercules S et al reported that the management of trigeminal neuralgia with pharmacotherapy was instituted for all patients with this disorder before any interventional therapy was attempted for pain relief.[11] Carbamazepine, an antiepileptic, was a well-established drug in the treatment of Trigeminal neuralgia. Various studies and authors have reported variable benefit and relapse rates in patients with Trigeminal neuralgia with carbamazepine. There was evidence that pregabalin and gabapentin were effective in neuralgic pain.[12,13]

Carbamazepine treats seizures and the symptoms of trigeminal neuralgia by inhibiting sodium channels. In bipolar 1 disorder, carbamazepine has been found to decrease mania symptoms in a clinically significant manner according to the Young Mania Rating Scale (YMRS).[14-16] Carbamazepine has a narrow therapeutic index. In studies of Han Chinese ancestry patients, a pronounced association between the HLA-B*1502 genotype and Steven Johnson syndrome and/or toxic epidermal necrolysis (SJS/TEN) resulting from carbamazepine use was observed.[17]

This study has certain limitations. For instance, since it only had 80 patients from a single centre, the findings of our study cannot be generalized to a larger population. A further large-scale study with a diverse population is required to find out the efficacy of both treatment regimes.

CONCLUSION

A combination of Carbamazepine with Gabapentin resulted in better pain control in patients with trigeminal neuralgia as compared to Carbamazepine. VAS score after 4th week in both groups (Group A (Carbamazepine alone), Group B (Carbamazepine plus Gabapentin), it was found that there was a significant difference score found in between both groups and significantly lower Group B as compared to Group A.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

Ethical approval was provided by the Institutional Review Board and Ethical Review Committee at Armed Forced Institute of Dentistry, Rawalpindi, Pakistan.

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AUTHORS CONTRIBUTION

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ORIGINAL ARTICLE

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Prevalence of Dens Invaginatus in Maxillary Lateral Incisors in Patients Visiting Peshawar Dental College and Hospital

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ABSTRACT

Objective: Dens Invaginatus is a developmental abnormality that may be found in any tooth but is most commonly noticed in maxillary lateral incisors. This study aimed to find out the prevalence of Dens Invaginatus in maxillary lateral incisors in patients reporting to Peshawar Dental College.

Materials and Methods: The study design was descriptive cross-sectional and conducted in Peshawar Dental College in the Department of Operative Dentistry and Endodontics from December 2021 to May 2022. Four hundred and twenty-eight patients' maxillary lateral incisors were examined clinically for any pit or groove on the palatal surface. Teeth with any clinically detected pit or groove were then confirmed radiographically and the questionnaire was filled. The chi-square test was used to analyze variables such as gender, type and whether dens invaginatus involvement was unilateral or bilateral. $P \leq 0.05$ was set significant.

Results: Dens Invaginatus was found in 25 of 428 subjects, with a prevalence of 5.8%. The age of the patients ranged from 12 to 71 years with a mean age of 35±13 years. There were 11 (4.6%) females and 14 (7%) males with Dens Invaginatus. Type I (71%) was the most frequently seen, type II (16%), and type III was seen in 13% of patients. Dens Invaginatus were noticed on both sides in 14 (7%) patients and on one side in 11(4.6%) patients.

Conclusion: The prevalence of Dens Invaginatus in maxillary lateral incisors was 5.8% in Peshawar region. Lateral Incisors were more bilaterally involved. Type 1 Dens Invaginatus were more commonly involved which requires minimal intervention to seal them.

Keywords: Dens Invaginatus, Lateral incisors, Peshawar, Prevalence

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INTRODUCTION

Developmental anomalies put at risk the teeth to pulpal and periapical pathosis and create considerable challenges to endodontic treatment. These anomalies affect the density and mineralization of the hard tissues of the tooth, alter pulpal size, generate unreachable zones to routine oral care measures thereby providing a safe opportunity for microorganisms, and add complication to endodontic intervention. These developmental anomalies affect the disease progress and treatment outcomes.[1]

Dens invaginatus (DI) is a developmental abnormality occurring because of the enamel organ invagination into the dental papilla, beginning at the crown and sometimes extending into the root before calcification occurs.[2] The other names of DI are dens in dent and dens telescope. It was first described by a dentist Socrates in 1856.[3] Maxillary lateral incisors is the most common tooth involved (90%) than central incisors, canines and premolars, frequently with bilateral occurrence (43%).[4,5] The severity varies from a pit to complicated abnormalities in the tooth.[6] The exact cause of DI is not vivid. There have been many theories advocated regarding the etiological factors involved in causing this abnormality.[7] These may include trauma, infection and growth force from neighbouring tissues during tooth development,[3] stimulation of internal enamel epithelium growth into the papilla and joining of the two tooth germs.[7] Genetic factors may also be involved in dens in dente.[2-5] The infolding formed results in the accumulation of a large number of organic debris in the pocket that leads to dental caries involving the crown and rapidly progressing into the root causing pulpal and periapical pathosis.[2,3]

Oehlers classified DI into three categories as shown in Figure 1. In type 1 the lesion remains confined in the crown and does not cross the cementoenamel junction (CEJ). Type 2 is partial invagination in which the lesion extends into the root and crosses the cement enamel junction. The pulp may or may not be involved. Type 3 is further divided into 2 subclasses; class 3a lesions reach out into the root and meet up with the periodontal ligament through the lateral foramen. Class 3b lesions also reach out into the root and meet up with the periodontal ligament through the apical foramen.[2,4]

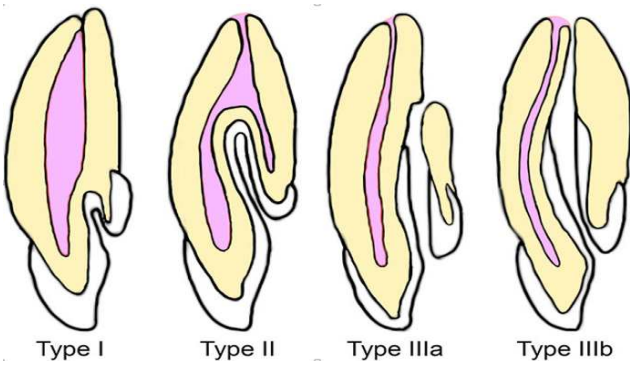

Figure 1: Oehlers' Classification of Dens Invaginatus

DI has a prevalence that ranges between 0.3%-10%. DI are more prevalent than germination (0.3%) and taurodontism (0.3%).[2] The prevalence of DI among different populations is (Saudi Arabia 7.3 %, Turkish 2.5 %, Japan 4 % USA 4 %, Sweden 3 % and Mexico 10 %).[7] Early detection of DI is important to take preventive measures to avoid complications associated with invaginatus which may range from caries to pulpal involvement and to challenging endodontic cases.[8]

This study aimed to find out the prevalence of DI in maxillary lateral incisors because it can pose challenges for dental treatment. The invagination may harbour bacteria, making the tooth more susceptible to caries. Furthermore, no such studies have been conducted in the Peshawar region; therefore, this study will help reveal the existence of such cases in the region.

MATERIALS AND METHODS

The approval of this study was taken from the Institutional Review Board (Prime/IRB/2021-339) of Prime Foundation. This descriptive cross-sectional study was conducted at the Department of Operative Dentistry and Endodontics of Peshawar Dental College & Hospital from December 2021 to May 2022. The study encompassed individuals of both genders, with ages between 12 and 71 years. Patients with other developmental anomalies and pregnant patients were not included in the study. Informed consent was signed from the patients and their lateral incisors and palatal surface were examined clinically for any pit or groove. Teeth with any clinically detected pit or groove were then confirmed by a periapical radiograph. Periapical radiographs were taken of both lateral incisors and the questionnaires were filled.

The WHO sample size calculator was used to determine

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the sample size. The estimated population proportion was taken as 0.2% with a confidence level at the standard of 99% and a 0.05 margin of error was set as indicated. The sample size was taken four hundred and twenty-eight (428) patients, selected from the OPD of the Department of Operative Dentistry and Endodontics. The data was entered and analyzed in SPSS version 20.0. The chi-square test was employed to analyze variables such as gender, type, and whether dens invaginatus involvement was unilateral or bilateral. $P \leq 0.05$ was set significant.

RESULTS

Four hundred and twenty-eight patients (428), 188 male and 240 female with a mean age of 35±13 years were studied. DI was found in 25 of 428 patients, with a frequency of 5.8% as shown in Table 1. Using chi-square analysis, no significant difference was found regarding the frequency of DI (p = 0.226). Table 2 shows the placement of DI according to gender. DI was found in 11 (4.6%) females and 14 (7 %) males. Type I (71%) was the most frequently seen, then type II (16%), and type III was seen in 13% of patients. Using chi-square analysis, no significant relation was found between gender and type of DI (X^2 = 0.220; df = 1; p =0.210).

Table 3: presents unilateral or bilateral occurrence of DI. DI were noticed on both sides in 14 patients and on one side in 11 patients. Analyzing using chi-square no significant relation was found between the unilateral and bilateral occurrence of DI (X^2 = 0.220; df = 1; (p =0.210).

DISCUSSION

The literature reveals significant variations in the prevalence of DI across diverse populations. Notably, this study indicated a prevalence of 5.8%. In a study involving 3020 Swedish children, a prevalence of 2.7% was reported.[9] Hamasha et al. found a prevalence of 2.9% in Jordanian dental patients.[10] While Ulmansky and Hermel reported a prevalence of 2%,[11] Cakici et al. reported a prevalence of 1.3% and Kirzioğlu and Ceylan[13] demonstrated a prevalence of 12% in the Turkish population. A study in Israel yielded a prevalence rate of 26%.[14] DI was identified in 13.5% of the Indian population.[15] These variations in prevalence could stem from ethnic differences, variances in diagnostic criteria, and differences in analytical methods.

The prevalence of dens invaginatus was somewhat higher in men than in women in the current investigation. These results are in agreement with another study that was previously published for patients with Jordanian ancestry. The prevalence for males and

Table 1: Frequency of Dens Invaginatus in Patients

	Frequency	Percent	*p*-value
Patient with Dens Invaginatus	25	5.8	**0.226**
Patient without Dens Invaginatus	403	94.2	
Total	428	100	

Table 2: Distribution of Dens Invaginatus in patients according to gender

	Gender		Total	*p*-value
	Male	Female		
Patient with Dens Invaginatus	14 (7)	11 (4.6)	25 (6)	**0.210**
Patient without Dens Invaginatus	174 (93)	229 (95.4)	403 (94)	
Total	188 (100)	240 (100)	428 (100)	

Table 3: Unilateral and Bilateral Frequency of Dens Invaginatus in the study group

Dens in Dente	Frequency (%)	*p*-value
Bilateral Dens Invaginatus	14 (3.3%)	**0.210**
Unilateral Dens Invaginatus	11 (2.6%)	
Total	428 (100%)	

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females was in 9 teeth (0.29%) and 3 teeth (0.008%), respectively.[10] However, additional research in the Turkish population found that both men and women experienced dens invaginatus on an equal basis.[12,13]

The presence of bilateral dens invaginatus was found by many authors. In the current study, the dens invaginatus was present bilaterally in 3.2% of cases, which was very different from studies conducted in Turkey[12] (23.1%) and Jordan[10] (24.49%). These differences might be because of variations in the sample size, patient choice, and the materials, and procedures used. So, more studies are required to explain the matter.

Maxillary lateral incisors with a deep pit must be clinically checked for DI even if there are no symptoms and due to often bilateral existence, lateral incisors should be bilaterally clinically examined. DI anomalies are commonly discovered by chance. It is not commonly found by patients unless clinical signs appear, such as an acute apical abscess or sinus tract. Most cases are found on radiographs.[15,16]

Oehlers proposed the most widely accepted classification of DI. Type I is a minor invagination that occurs within the crown and does not extend beyond the cementoenamel junction. In Type II, invagination reaches the root but eventually develops into a blind sac with or without a pulp connection. Type III refers to an invagination that extends from the root to the apical area and creates a second foramen in the periodontal or apical region.[2, 4] In the current investigation, type I DI was most observed (71%), type II (16%), while type III DI was found in 13% of patients. The results of this study are in harmony with previous literature. One study showed the most commonly seen type of dens invaginatus was type I (73%) followed by type II (20%) while 7% of patients had type III dens invaginatus,[9] while the other study reported type I being the most common (79%), type II (15%) and type III (5%).[12] Additionally, Alani and Bishop [9] reported 79% of the teeth with dens invaginatus being type I. A study on the Turkish population showed that type I was the most common type of dens invaginatus with a prevalence of 81.25%.[13]

Sealing or restoration, root canal, periapical surgery, intentional replantation, and removal of the tooth are among the treatments available for invaginated teeth.[17,18] Irrespective of the periapical lesion's size, surgical therapy should only be carried out after nonsurgical root canal treatment has failed. The treatment method should not be determined by the periradicular lesion's size.[19-21]

One restriction of the study was that the sample size taken was comparatively smaller and may not represent the true picture of this population. Therefore, the data should be used with care as it may not represent the actual figures. Future studies should be conducted on CBCT imaging as it is an indispensable tool for the diagnosis and treatment of DI. Further extensive multicenter studies are required to find out the prevalence of dens in dente in the population.

CONCLUSION

This study showed the prevalence of DI to be 5.8% in this region with maxillary lateral incisors most commonly involved. Lateral Incisors were more bilaterally involved. Type 1 dens in dente were more commonly involved which requires minimal intervention to seal them.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

The ethical approval is provided by the Institutional Review Board of PRIME Foundation (Ref: PRIME/IRB/2021-339).

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Approval of the final version of the manuscript to be published: I. Akbar, R. Qureshi, S. Rashad, M. Noor

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ORIGINAL ARTICLE

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Self-Perceived Dental Public Health Competencies of Dental Graduates: A Comparison of Traditional and Modified Curricula in Karachi

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ABSTRACT

Objective: To compare self-perceived dental public health competence in fresh dental graduates, learning through traditional and modified dental curricula in private dental colleges of Karachi.

Materials and Methods: A cross-sectional study with a self-administered questionnaire (21 items) on a 3-point Likert scale was conducted with dental graduates of four private dental colleges in Karachi. Data were analyzed using SPSS version 23. Mean and SD were reported for age and self-perceived competency scale items were analyzed by applying an independent t-test.

Results: 255 participants completed the survey (response rate=88.5%) with a mean age of 24.02±0.832 (male 24% & female 76%) ranging from 22 to 26 years. The graduates were of almost equal number from both the groups (T=51%, M=49%). Graduates who learnt public health from a traditional curriculum had a higher perception of their competence compared to the modified curriculum group with a significant *p*-value=0.04.

Conclusion: This study identified that overall fresh dental graduates perceived themselves competent enough to deal with dental public health issues. Moreover, dental graduates who studied from the traditional curriculum perceived themselves as more competent in most aspects of dental public health competency than those who learned from the modified curriculum.

Keywords: Competencies, Curriculum, Dental Graduates, Dental Public Health, Self-perception

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INTRODUCTION

Dental Public Health (DPH) is an essential component of dental graduate programs worldwide and is considered one of the nine recognised specialities of Dentistry.[1,2] The dental graduates are expected to have a high level of confidence, inspirational qualities and skills in dealing with public health issues to improve overall dental health and be able to face the challenges

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of the changing needs of society. These challenges can be more demanding in developing countries like Pakistan, where a consistent decrease is noted in the Human Development Index (HDI),[3] due to rapid population growth and a shortage of health workers, including dental health professionals.[4] In addition, there is a severe dearth of evidence from this part of the world on the current status of graduates' competence to deal with public health issues.

The above situation of under-developed public health services to the community can be alleviated by empowering the graduates with appropriate training to use technology,[5] and increase awareness, knowledge and skills to provide effective oral healthcare at an affordable price. Therefore, the undergraduate dentistry curriculum must be taught in a way that encourages students' abilities to deal boldly with concerns of public health and meet the requirements of the community. However, the dental education system implemented in most institutes and universities in Pakistan follows a traditional teacher-centred approach where most of the content is delivered through didactic lectures. This approach is not considered ideal for students' capacity building and skills development especially when it comes to dental public health functions.[6,7] Therefore, the centre of attention of some of the dental institutes, shifted to developing an innovative dental curriculum to obtain desired learning outcomes which was based on a student-centred approach where undergraduates experience self-directed and active learning approaches for future practices.[6] These institutes, although use a similar curriculum for teaching public health or community dentistry in year three of a four-year Bachelor of Dental Surgery (BDS) program, incorporating active learning, small-group discussions and self-directed learning, known to enhance deep learning. However, it remains uncertain whether these approaches have been part of curriculum delivery and whether they have any visible impact on BDS program outcomes as no evaluation conducted thus far.[7]

One indicator of students' knowledge and abilities in the field may be their perceptions of their competency in public health dentistry which is not much evident in the literature locally so far. Thereby, providing an opportunity to identify gaps in the current curriculum for undergraduate BDS programs. This initiative could potentially lead to a deliberate modification to the nation's present dental public health curriculum, identifying competencies that dental graduates' lack, and help in achieving required outcomes. This will result in better-skilled dental graduates who could prevent and reduce dental public health problems.[8]

Therefore, this study aims to assess fresh dental graduates' perceptions regarding their competencies in dealing with dental public health functions. The study also investigates possible differences among the perceptions of students graduating from two different systems of curriculum delivery.

MATERIALS AND METHODS

A cross-sectional study was conducted between February and April 2021, in four dental colleges in Karachi, Pakistan. Non-probability, convenience sampling technique was used. The participants included in this study were all recently graduated from dental colleges, starting their house job, and currently doing the house job at recognised dental hospitals in Karachi, Pakistan. The recently graduated, but year-back dental students and students who got supplementary in Community Dentistry were excluded from the study.

The sample size calculation for this study was done by using Open Epi Software (CI:95%) via the website (www.openepi.com) which was 238 with Population size (for finite population correction factor or fpc) (N): 620**,** Hypothesized % frequency of outcome factor in the population (p): 50 % +/-5, Confidence limits as % of 100 (absolute +/-%)(d): 5%and Design effect (for CS surveys- DEFF): 1.

Ethical approval for the study was obtained from the Institutional Review Board of Dow University of Health Sciences (IRB-1596/DUHS/Approval/2020), Karachi, Pakistan. Permission letters were also taken from all dental colleges included in the data collection. Participants were provided with detailed information regarding the research and written consent was obtained when the questionnaire was distributed to the willing participants.

The instrument used in this study was a validated self-administered, 21-item questionnaire, utilized in several previous studies.[9-11] The questionnaire was in the English language as the graduates' medium of education. The questionnaire was piloted for improvement and sequencing of questions by subject experts. In the questionnaire, the participants were

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S.no	Aspects	Functions/Items
1	Recognizing problems related to socioeconomic factors and health in our community	1, 2,3
2	Promotion of oral health and preventing diseases	4, 5 6,7,8 & 9
3	Usage and adaptation of appropriate technical, physical and legal measures	10,15 & 16
4	Interpersonal and administrative skills	11,12,13,14,18,19 & 21
5	Research and surveillance practices in dental public health.	17 & 20

asked to rate how competent they perceive themselves on each dental public health function by using a 3-point Likert-type scale.[12] The 21 items in the questionnaire were subdivided into five aspects on which the respondents were assessed for self-perceived competencies.

Three experts, masters in community dentistry and specialists in the field, reviewed the questionnaire and discussed each item for its appropriateness, language, feasibility, content and face validity.

Pilot testing was performed after the experts validated the questionnaire. Pilot testing aimed to identify items that lack clarity among respondents. The data was collected from 15 individuals not included in the study using the modified version of the questionnaire. After ten days, the data was again collected from the same individuals for further changes, if required. However, no changes were made in the second round of review. Reliability analysis of the questionnaire was conducted on the pilot data of 15 individuals. The Cronbach's alpha was estimated as 88.5% (0.88), which indicated good reliability.

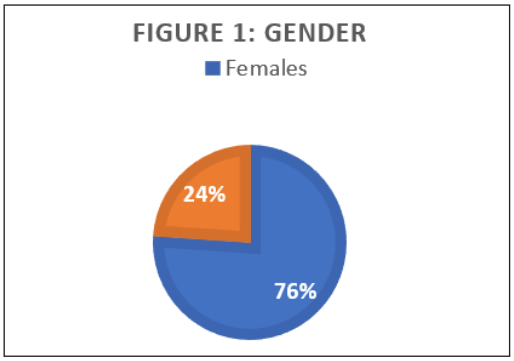
Data were analyzed using SPSS version 23. Mean and SD were reported for age and self-perceived competence scale items. In addition, frequency and percentage were computed for gender and university with descriptive statistics. A comparison of dental public health competencies scores among graduates learning through two different types of curricula was done using an independent t-test. A *P*-value ≤0.05 was taken as statistically significant.

RESULTS

Out of 288 responders (response rate=88.5%), 255 students from four dental colleges in Karachi, Pakistan, were included in the final analysis. The mean age of graduates was 24.02 (±0.832) years ranging from 22 to 26 years, with a significant female preponderance There was almost equal participation of students graduating from traditional and modified curricula as shown in Figures 1 and 2.

Table 1 shows the mean score with the standard deviation of each function of the self-perceived competency scale of all the fresh dental graduates. The majority of the graduates perceived themselves to be competent in most of the functions according to the means score below. The highest score was reported for item "elaborate common oral health problems in community" and the lowest score for item "Participate in systematic collection analysis and dissemination of data for planning, implementation and evaluation of public health programs."

Table 2 presents the mean scores of self-perceived dental public health competencies of graduates



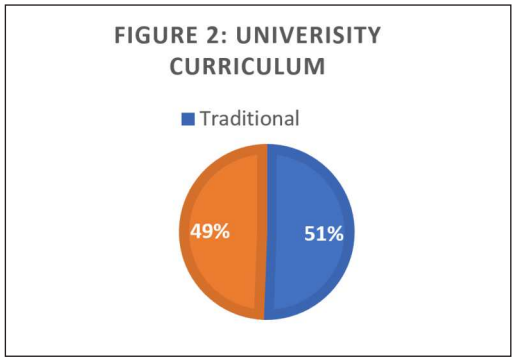


Figure 1 and 2: Baseline Characteristics of Study Variables

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Table 1: Descriptive statistics of 21 functions in the self-perceived competency scale

S.no.	Items: Were they able to:	Mean±SD
1	Elaborate social, economic and cultural problems faced by the community.	1.05±0.679
2	Elaborate common health problems in the community.	1.19±0.632
3	Elaborate common oral health problems in the community.	1.32±0.620
4	Develop awareness programs regarding physical & oral health problems for the community.	1.17±0.675
5	Promote health & oral health education through counselling skills.	1.27±0.711
6	Train community agents to spread basic health and oral health awareness.	1.05±0.746
7	Promote health & oral health by creating quality dental health facilities.	0.98±0.715
8	Design, develop and evaluate community preventive interventions.	0.96±0.714
9	Design, develop and evaluate community restorative interventions.	0.95±0.733
10	Apply basic maintenance to dental equipment and instruments.	1.03±0.617
11	Plan and program delivery of oral health services at the community level.	0.97±0.729
12	Manage health care systems with different health professions working in groups?	1.01±0.701
13	Manage the quality dental practice in the private and public sectors.	0.97±0.731
14	Use your knowledge and skills to get incorporated into the public health system	1.16±0.653
15	Use appropriate technologies and ergonomics in dental practice.	0.88±0.700
16	Adjust the dental practice to the existing laws and regulations.	1.04±0.660
17	Participate in syste matic collection analysis and dissemination of data for planning, implementation and evaluation of public health programs.	0.85±0.665
18	Deal with different challenges during dental practices like medical emergencies?	1.12±0.662
19	Interact with other health professionals to improve community health needs.	1.03±0.666
20	Contribute to research work (production/dissemination) related to public health	0.96±0.684
21	Incorporate dental practice into your personal and community development.	0.99±0.673

Table 2: Comparison of scores and mean scores of dental public health competencies among graduates learning through two different types of curricula

University Curriculum	Scores	Mean±SD	*p*-value
Graduates from Traditional	22.99	1.09±7.73	0.041
Graduates from Modified	20.94	0.99±8.15	

comparing two types of curricula, showing slightly higher self-perceived competence scores from the traditional than modified curriculum with a statistically significant value (p=0.041).

Table 3 shows the average mean score of items defining each aspect of the scale concerning the self-perception of graduates studied from modified and traditional curricula regarding dental public health competencies. Results showed the mean score of all aspects related to dental public health was higher for students studied from traditional curricula than modified ones. Some of the items' mean scores of different aspects were also statistically significant.

However, the mean scores of one of the items of the aspect “Oral health promotion and disease prevention”; where the fresh graduates were able to “develop awareness programs regarding physical & oral health problems for the community”, were significantly higher

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for the modified one than traditional curriculum with statistically significant value (p=0.046).

DISCUSSION

This study was conducted to explore the self-perceived dental public health competencies of fresh dental graduates, using a validated 21-item questionnaire, looking at various aspects of dental public health. It provides information about what dental graduates think about their abilities in dental public health, against what they know about the discipline. It may (or may not) be reflective of the graduates' actual competence.

The study findings interestingly showed that most respondents considered themselves competent in dealing with dental public health issues. This could be due to their limited knowledge about the discipline as the content of the community dentistry curriculum in most undergraduate programs is over-simplified and superficial. For example, the curriculum mainly focuses

Table 3: Comparison of the mean average of each aspect item scores of dental public health competencies among graduates learning through two different types of curricula

Aspects (functions): Were they able to:	Type of Curriculum	Mean±SD	*p*-value	Mean Average
Recognition of problems in the community				
Elaborate social, economic and cultural problems faced by the community.	Traditional	1.11±0.664	0.203	**Traditional** 1.23±0.640
	Modified	1.00±0.693		
Elaborate common health problems in the community.	Traditional	1.23±0.644	0.303	
	Modified	1.15±0.621		Modified 1.14±0.645
Elaborate common oral health problems in the community.	Traditional	1.37±0.613	0.188	
	Modified	1.27±0.625		
Oral health promotion and disease prevention				
Develop awareness programs regarding physical & oral health problems for the community.	Traditional	1.09±0.674	**0.046***	**Traditional** 1.07±0.707
	Modified**	1.25±0.669		
Promote health & oral health education through counselling skills.	Traditional	1.22±0.770	0.224	
	Modified	1.33±0.643		
Train community agents to spread basic health and oral health awareness.	Traditional	1.11±0.710	0.184	
	Modified	0.98±0.780		Modified 1.05±0.716
Promote health & oral health by creating quality dental health facilities.	Traditional	0.91±0.734	0.117	
	Modified	1.05±0.691		
Design, develop and evaluate community preventive interventions.	**Traditional****	1.09±0.650	**0.005***	
	Modified	0.83±0.756		
Design, develop and evaluate community restorative interventions.	Traditional	1.00±0.707	0.262	
Technical, physical and legal measures				
Apply basic maintenance to dental equipment and instruments.	Traditional	1.05±0.623	0.619	**Traditional** 1.04±0.666
	Modified	1.01±0.613		
Use appropriate technologies and ergonomics in dental practice.	**Traditional****	0.98±0.734	**0.029***	
	Modified	0.79±0.652		Modified 0.93±0648
Adjust the dental practice to the existing laws and regulations.	Traditional	1.09±0.643	0.263	
	Modified	1.00±0.681		

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Interpersonal and Administrative skills				
Plan and program delivery of oral health services at the community level?	Traditional	0.94±0.726	0.554	**Traditional** 1.08±0.709
	Modified	0.99±0.732		
Manage health care systems with different health professions working in groups?	**Traditional****	1.12±0.736	**0.005***	
	Modified	0.88±0.652		
Manage the quality dental practice in the private and public sectors.	Traditional	0.98±0.744	0.725	
	Modified	0.94±0.719		
Use your knowledge and skills to get incorporated into the public health system.	Traditional	1.22±0.684	0.164	
	Modified	1.10±0.617		
Deal with different challenges during dental practices like medical emergencies?	Traditional	1.14±0.622	0.527	Modified 0.97±0.665
	Modified	1.09±0.693		
Interact with other health professionals to improve community health needs.	**Traditional****	1.13±0.744	**0.005***	
	Modified	0.90±0.563		
Incorporate dental practice into your personal and community development.	Traditional	1.05±0.665	0.094	
	Modified	0.91±0.681		
Research and Surveillance				
Participate in systematic collection analysis and dissemination of data for planning, implementation and evaluation of public health programs.	**Traditional****	0.95±0.688	**0.021***	**Traditional** 1.02±0675
	Modified	0.75±0.628		
Contribute to research work (production/dissemination) related to public health.	**Traditional****	1.09±0.662	**0.002***	Modified 0.78±0.657
	Modified	0.82±0.686		

on theoretical aspects, with a few awareness activities like primary school trips to spread oral health education. Similar findings were reported by Ridhima B Gaunkar with other researchers in 2016 where he reported, that fresh graduates scored 22.61±10.94 indicating themselves to be capable of handling the community needs of oral health., following Eduardo Bernabé with his fellows in 2006 presented that dental graduates felt "very competent" by 32.57±9.91 points, in solving oral health needs at the community level. Moreover, Arzu Pınar Erdem with his colleagues in 2019 reported that the self-perceived competency of graduates in dealing with dental community issues was positively correlated with the total Professional Preventive Knowledge Scale. ($r = 0.192$; $p=0.031$) however, their assumptions were based on a lack of in-depth knowledge about the discipline as in the same study 40 % of dental students also demanded educational and training needs related to some major functions of dental public health dentistry.[9,11,13]

The study also compared the self-perceived competence scores for dental graduates from traditional and modified curricula to assess similarities and differences in perceptions. Overall, most graduates scored lowest in items like "systematic collection analysis and dissemination of data for planning, implementation and evaluation of public health programs and dental ergonomics". The findings showed that graduates who studied with two distinct types of curricula (traditional and modified) had differing perceptions of their abilities. The graduates from a modified curriculum rated themselves as least competent for research and surveillance, then dealing with technical, physical, and legal measures, followed by interpersonal and

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administrative skills (ability to manage medical emergencies). These findings were consistent with one of the recent studies conducted in Iran[12], where students were not very competent in "understanding the components and functions of the healthcare system", "planning" and "oral health research. Moreover, our study results showed a slight but significantly high level of reported self-perceived competence (means 22.99±7.73 vs 20.94±8.15) by the graduates from the traditional curriculum. Similar results were discovered in research conducted in Saudi Arabia, where dental students demonstrated a greater degree of perceived readiness for dental health practices from the standard curriculum than the integrated one.[15,16] These results may reflect a lack of evaluation in our education system that can monitor harmony and implementation of appropriate teaching strategies and authentic assessment methods which would be practised, It's possible that ways of teaching and learning have been consistent and the process has been changed and made more demanding. Or it may reflect that the graduates from a modified curriculum may have more in-depth knowledge of the discipline, and therefore, they scored their competencies lower. Conversely, the graduates from the traditional curriculum, with shallower knowledge, are more confident in their competencies. However, these inferences could not be supported by evidence, which is mostly equivocal in this area.

Nevertheless, some studies have reported an influence of the institute's location on students' confidence level in their dental public health competencies. A study from Thailand reports graduates having less confidence in public health competencies when studying in the vicinity of Bangkok, where there is a traditional style of teaching compared to institutions located outside Bangkok using modern teaching methods.[17] Likewise, another published article from Eley DS 2010 suggested that the educational institution's location has a significant impact on dental graduates' confidence levels. It was reported that forty-eight per cent of junior doctors had chosen to spend a portion of their undergraduate training in a rural clinical setting. These differences could be attributed to the community experience of students during their undergraduate years.[18]

There could be a variety of other factors that can potentially influence the graduates' competencies (or perception of competencies) in a discipline like dental public health. These may include the type and implementation of curriculum, faculty's ability to deliver, assessment methods used, educational environment and setting[18], to name a few. In one of the recent studies, it has been observed that well-developed countries are rigorously evaluating their dental public health curricula taking guidance from different current standards and trying to enhance competence in dental public health of dental graduates.[19]

The data was collected from different dental colleges in Karachi that shared a similar curriculum affiliated with the same university. Although the inferences from this study may be generalized to graduates from other institutes with the same curriculum type, they may not be reflective of the rest of the country. The study is on self-perceived competency scores which may not assure real competence.[20] However, because we lack objectivity and standardization in the tests of competency regarding essential core items and domains of dental public health, self-perceived competency surveys may give an acceptable level of utility.[21,22]

Nevertheless, despite these limitations, this study provides valuable baseline information on the self-perceived competence regarding functions of public health dentistry among fresh dental graduates specifically as there was a dearth of literature locally. Recently a study reported the preparedness of Dental graduates by Mohammad Qasim Javed and colleagues where he identified shortcomings in multiple soft skills and clinical attributes among dental students and recent graduates in Pakistani dental institutions.[23] The findings shed light on both the strengths and areas demanding improvement among these individuals but not specific to public health dentistry which is getting insufficient emphasis.

The study provides valuable information to initiate the review process for existing dental public health curriculum in Pakistan as done by other countries like USA[24] to identify gaps in present content and its implementation, embedding core skills aligning with appropriate teaching and authentic assessment required to build a competent dental graduate to deal with overlooked aspects of dental public health.[25]

CONCLUSION

The study identified that dental graduates perceive themselves as competent to deal with dental public

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health issues, however, the overwhelming perceptions are not consistent with the conditions of dental public health in Pakistan. Therefore, the authors recommend that educationists should focus on identifying the competencies required to produce competent dentists to serve the community and ensure that those competencies are incorporated into the undergraduate dental curriculum effectively to improve public health dentistry in Pakistan.

DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

The ethical approval is provided by the Institutional Review Board of Dow University of Health Sciences (Ref: IRB-1596/DUHS/Approval/2020).

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AUTHORS CONTRIBUTION

Conception and design of the study: S. Sarfaraz, M.S. Shamim

Acquisition of data: S. Sarfaraz

Analysis and interpretation of data: M.K. Nisar

Drafting of the manuscript: Z. Khurshid, S. Sarfaraz, M.S. Shamim

Critical review of the manuscript: B. Sajjad. M.S. Shamim

Approval of the final version of the manuscript to be published: S. Sarfaraz, M.K. Nisar, Z. Khurshid, B. Sajjad, M.S. Shamim

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Perception of Pain after Insertion of Mini-Screws in Orthodontic Patients

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ABSTRACT

Objective: To measure the pain perceived by the patient after the insertion of an orthodontic mini screw.

Materials and Methods: It was a descriptive cross-sectional study conducted in the Out-Patient Department of Orthodontics, Margalla Institute of Health Sciences, Rawalpindi for 8 months. The sample size used was 35. Self-drilling mini-screws (8mm x 1.6mm) were manually inserted. Patients were asked to report pain scores at 1 hour, 12 hours, 24 hours and 1 week on a Visual Analogue Scale. Data was analysed using Statistical Package for Social Sciences (SPSS) 21. Analysis of variance was used to compare the pain score at different time durations. The level of statistical significance was $P \leq 0.05$.

Results: There were 11 (31.4%) males and 24 (68.6%) females with a mean age of 18.66±3.404 years. The mean pain scores up to 1 hour was 0.83±1.014, from 1-12 hours was 1.06±1.083, from 12-24 hours was 0.14±0.355 and from 24 hours-1 week was 0±0. Out of the total, five (14.3%) patients had to take analgesia in the first hour, while during 1-12 hours, 12-24 hours and 24 hours per week, nine (25.7%), seven (2.9%) and zero took the analgesics respectively.

Conclusion: The pain experienced with mini-screw insertion is low. The greatest pain was recorded in 1-12 hours following insertion, after which it started to decrease.

Keywords: Mini-Implants, Orthodontic Anchorage Procedures, Orthodontics, Pain Perception, Screws

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INTRODUCTION

Anchorage is one of the most important factors considered for a successful orthodontic treatment.[1] It is defined as 'the resistance to unwanted tooth movement.[2] There are multiple ways to reinforce anchorage, including Nance holding arch, headgear, class II elastics etc., but all of these methods have certain disadvantages like design complexity, patient compliance, the need for elaborate wire bending and chances of potential iatrogenic injuries. In recent years, due to its versatility, minimal invasiveness, useful dimensions, low cost, and no requirement for lab work or patient compliance, the mini-screw has gained enormous popularity in the orthodontic community. It has provided an excellent

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alternative to conventional anchorage reinforcing methods.[3,4]

An orthodontic mini-implant has been defined as a device specially designed to be placed within, through, or upon the bones of the craniofacial complex to supply orthodontic anchorage.[5] Mini-implants, also called Temporary anchorage devices (TADs) have different parts, a head, neck, core (body) and thread. The core is the part that is inserted into the bone and provides maximum stability.[6] Over the years, various designs have been introduced to improve the biomechanical features and clinical efficacy, but the more recently introduced lightweight, self-drilling mini-screws are very versatile and user-friendly.[7] The pointed screw tip and guiding threads enable them to be inserted without drilling.[8] They can be placed anywhere in the jaw considering that there is sufficient bone, and no anatomic structure is damaged while placing the implant. They can help move teeth in all three planes of space, providing the option of both direct and indirect anchorage.[9]

Orthodontic pain and orthodontic tooth movement are two interrelated and dependent biological events.[1] Pain has been defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.[10] The fear of pain is one of the causes of patients deferring orthodontic treatment, decreasing compliance or discontinuing the treatment.[11,12] The popularity of mini-screw among contemporary orthodontists has added another potentially painful element to orthodontic therapy.[13,14]

Orthodontists usually underestimate the degree of pain caused by treatment.[9] Our knowledge of treatment perception can help to provide patients with realistic expectations of the likely pain that will be encountered during orthodontic treatment.[11] Baxmann M. et al[15] concluded that micro-implant placement seems to be a well-accepted treatment option in orthodontic patients with significantly lower pain levels than tooth extractions. Lee et al showed in a cohort study that patients expect the buccal placement of the mini-screw to be more painful than it is.[11] In Pakistan, one pilot study has suggested that there is no significant difference between the pain expected and actually perceived by the patient.[16] To the best of our knowledge, limited studies on pain perception after orthodontic mini-screw insertion were conducted in our population. The purpose of this study was to determine the pain perceived by the patient after the insertion of orthodontic mini-screws, in order to educate the patients.

MATERIALS AND METHODS

It was a descriptive cross-sectional study, carried out in the outpatient department of orthodontics, Margalla Institute of Health Sciences, Rawalpindi. The study duration was 8 months (24-07-2019 to 24-03-2020). A total of 35 patients were included in the study using non- probability consecutive sampling.

Only patients undergoing fixed orthodontic treatment with ages ≥ 11 years to ≤ 25 years and having mini-screws as part of their treatment plan were included in the study. Patients with any syndrome/ mental illness/ systemic disease, taking medications for chronic pain, with severe bone loss or having mixed dentition were excluded.

After the approval from the hospital's Ethics Review Committee, informed consent was taken from the patients fulfilling the selection criteria. All the mini-screws were inserted by the author in the maxillary bone. Pre-surgical periapical radiograph of the implant insertion site was taken. After the application of topical anaesthesia with 20% Benzocaine gel (Benzo-jel, Henry Schein), buccal infiltration of less than 1/4th of the cartridge Lignocaine HCl 2% was given (lidocaine hydrochloride 20 mg/mL, adrenaline 10 mcg/mL, Septodont, France). The patient was asked to rinse with 0.2% Chlorhexidine mouthwash (Clinica Mouthwash, platinum pharmacy) for 60 seconds before mini-screw placement. Self-drilling mini-screw (8mm x 1.6mm, sterile bone screw S16- JB-008H, Jeil Medical Corporation, Korea) were manually inserted with an implant driver. A periapical radiograph was taken after complete insertion to evaluate the position of the mini-screw.

Patients were requested to notify the operator if any pain or discomfort was experienced during the procedure. Patients were asked to document their level of pain using VAS from 1-10, with 0 being no pain and 10 being the maximum pain felt at 1 hour, 12 hours, 24 hours and 1 week after mini-screw insertion and to answer questions concerning analgesics with a 'yes' or 'no' response. The patients were advised to take Paracetamol 500mg if they needed to. The patient was

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Table 1: Responses of orthodontic patients regarding pain after insertion of mini-screws

Duration	Pain experienced n (%)					Mean ±SD
	0	1	2	3	4	
Up to 1 hour	16(45.7)	13(37.1)	3(8.6)	2(5.7)	1(2.9)	0.83±1.014
1 hr 1 min – 12 hrs	13(37.1)	12(34.3)	6(17.1)	3(8.6)	1(2.9)	1.06±1.083
12 hr 1 min– 24 hrs	30(85.7)	5(14.3)				0.14±.355
24 hr 1 min – 1 week	35(100)					0±0

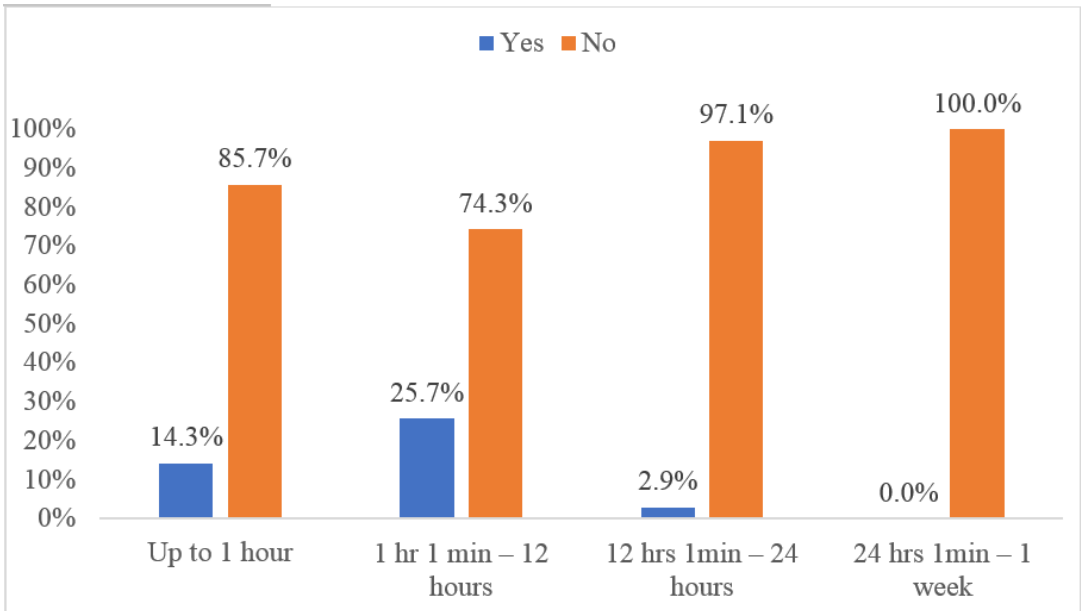

Figure 1: Orthodontic patients who have taken analgesics at different times

Table 2: Gender-wise difference in responses of orthodontic patients regarding pain experienced after insertion of mini- screws

Duration	Total number of analgesics		Mann Whitney U test	
	Male	Female	z-value	*p*-value
Up to 1 hour	0.27±0.647	0.17±0.482	-0.47	0.793
1 hr 1 min – 12 hrs	0.09±0.302	0.38±0.576	-1.52	0.252
12 hrs 1 min – 24 hrs	0.00±0.000	0.04±0.204	-0.68	0.847
24 hrs 1 min – 1 week	0.00±.000[a]	0.00±.000[a]	0	1

Table 3: Age-wise difference in responses of orthodontic patients regarding pain experienced after insertion of mini- screws

Duration	Pain experienced Age (years)			Kruskal Wallis Test	
	12 - 16	17 - 20	21 - 25	z-value	*p*-value
Up to 1 hour	1.22±0.97	0.67±1.11	0.73±0.90	0.92	0.409
1 hour – 12 hours	1.44±1.24	0.87±0.83	1.00±1.26	0.814	0.452
12 hours – 24 hours	0.11±0.33	0.13±0.35	0.18±0.40	0.102	0.903
24 hours – 1 week	0.00±0.00	0.00±0.00	0.00±0.00	0.92	0.409

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called after 1 week for routine examination and loading. The stability of the mini-screws and gingival health around the mini-screws were also evaluated.

The data was analysed using Statistical Package for Social Sciences (SPSS Version 21.0, IBM Corp., Armonk, NY). Quantitative variables like age and pain score were represented in the form of mean and standard deviation. Qualitative variables like gender were represented by frequency and percentage. Analysis of variance (ANOVA) was used to compare the pain scores at different time durations. The level of statistical significance was $p \leq 0.05$.

RESULTS

All the data was analysed using Statistical Package for Social Sciences (SPSS Version 21.0, IBM Corp., Armonk, NY). A total of 35 patients were included in this study. None of the inserted mini-screws were lost during the study period. All participants completed the questionnaire. There were 11 (31.4%) male patients and 24 (68.6%) female patients. The mean age of the patients was 18.66±3.404. Most of the patients were between 17-20 years, as 15 (42.9%) out of the total patients, belonged to this age group.

The responses of patients when asked about pain scores at different time intervals are shown in Table 1. The maximum pain score marked by the patient at any time was four. The Mean± SD pain score up to 1 hour was 0.83±1.014. Here, 16 (45.7%) patients experienced zero pain, 13 (37.1%) experienced pain with a score of 1, 3 (8.6%) experienced pain with a score of 2, 2 (5.7%) experienced pain with a score of 3 and only 1 (2.9%) patient experienced pain with score 4. The Mean± SD pain score from 1-12 hours was 1.06±1.083. This was the highest among all. The majority of the patients i.e., 13 (37.1%) experienced zero pain, whereas 12 (34.3%) experienced pain with a score of 1, 6 (17.1%) experienced pain with a score of 2, 3 (8.6%) experienced pain with score 3 and only 1 (2.9%) patient experienced pain with score 4. The Mean± SD pain score from 12-24 hours was 0.14±0.355. During this time duration, 30 (85.7%) patients experienced zero pain and only 5 (14.3%) patients experienced pain which was of pain score of 1. All 35 (100%) patients experienced zero pain between 24 hours and 1 week after the insertion of the mini-screw, therefore the Mean± SD pain score was 0±0.

Figure 1 demonstrates the response of patients when asked if they took any analgesics at different times. The majority of the patients i.e., 30 (85.7%) said that they did not take any analgesic for up to one hour and only 5 (14.3%) patients took analgesics during this time. In the duration from 1-12 hours, only 9 (25.7%) patients took the analgesic. This was the maximum number of patients recorded for taking analgesics. In the period from 12-24 hours, only one (2.9%) patient reported taking an analgesic. None of the total 35 (100%) patients took any analgesic in the period between 24 hours–1 week after the insertion of the mini-screw.

The last part of the questionnaire acquired the data regarding the total number of analgesics taken at different times. Up to 1 hour, out of the five patients who took the analgesics, 3 (8.6%) patients reported taking 1 tablet and 2 (5.7%) patients reported taking 2 tablets. The highest Mean±SD (0.29±.519) for the number of painkillers was recorded at times from 1-12 hours. During this time, out of the nine patients, eight (22.9% of the total) patients took one tablet, and one (2.9% of the total) patient took two tablets. From 12-24 hours, only one tablet of analgesic was taken by the patient. There was no statistically significant difference between males and females regarding the pain experienced with the mini-screws at any time as shown in Table 2.

There was no statistically significant difference in different age groups regarding pain experienced with mini-screw insertion. A significant difference was found in age groups when considering taking analgesics, at the time from 1-12 hours; more patients (55.5%) from the age group 12-16 years were found to have marked 'yes' in this section. In addition, significant results were found when a total number of analgesics were compared. From 1-12 hours, patients aged 12-16 took more analgesics (M±SD=0.67±0.71) as shown in Table 3.

DISCUSSION

Orthodontic treatment is considered a painful procedure.[11] It is known that it not only originates a sensation but negatively affects the patients' quality of life in terms of health and activity.[17] Therefore, this fear is one of the causes of patients deferring orthodontic treatment, decreasing compliance or discontinuing the treatment.[11,12] Orthodontic mini-screws have added another potentially painful element to orthodontic therapy, and the fear of pain in patients is likely to affect

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the process of treatment.[13,18]

Anchorage planning is the foundation of an orthodontic treatment plan. With the introduction and advancement of mini-screws, it has become a widely used option in the orthodontic practice.[3] A major advantage of mini-screw implants is the ease by which they can be placed by the orthodontist accurately at the desired site.[19] They can be placed anywhere in the jaw considering that there is sufficient bone and no anatomic structure is damaged while placing the implant. Their versatility in tooth movement has enabled orthodontists to successfully treat many complex and challenging malocclusions with a relatively easy approach.[20]

The literature provides numerous data regarding pain association with orthodontic treatment, but limited articles have focused on patients' experience of pain for orthodontic treatment with mini-screws. Therefore, the purpose of this study was to determine the perception of pain after the insertion of a mini-screw in orthodontic patients. Our knowledge of treatment perception can help to provide patients with realistic expectations of the likely pain that will be encountered during orthodontic treatment.

There are several pain assessment tools or pain scales that have been validated over the years for use by health professionals. This study used a Visual Analogue Scale from 0-10 to assess the pain scores, with 0 representing 'no pain' and 10 representing 'worst pain'. Lee et al. used a VAS with a score from 0-100 in their study.[11] The difference is only that 0-10 scores are represented on a centimetre scale and 0-100 on a millimetre scale. The benefits of the VAS are that it has been validated and shown to be sensitive to changes in a patient's pain experience. It is easy to understand and rapid to fill for most of the patients.[21]

In this study, the mini-screws were only placed in the maxilla. A previous study done by Lee et al. did not limit the mini-screw placement to one jaw and included both the maxilla and the mandible.[11] This decision to exclude the mandible from the study was based on the fact that the maxilla and mandible have different bone densities and stress loads.[22] Due to higher bone density of the mandible, higher insertion torque is needed which can also cause overheating of the mandible during mini-screw placement. The implant placement in the mandible also sometimes requires pre-drilling.[23] These factors could affect the pain scores experienced by the patients.

All the mini-screws in this study were placed under local anaesthesia. Most of the clinical studies placed the mini-screws under local anaesthesia,[4,24] but some studies suggested the use of topical anaesthesia only. They suggest that topical anaesthesia is simpler to use, comfortable for the patient, and lacks tissue ballooning thus leading to the easier placement of mini-screws. A most important factor of topical anaesthesia is that the patient can be notified if the mini-screw is placed close to the root. Lamberton et al, however, suggest that topical anaesthesia is less predictable and less comfortable to the patient when compared to local anaesthesia.[25]

The results of this study showed that the pain score experienced at any level was not more than four and the highest mean score recorded at any time was 1.06±1.083, deducing that the maximum pain experienced is of a low level. Baxmann M. et al,[15] also when compared the mini-screw with other variables like extraction, concluded that pain experienced with mini-screws is of significantly lower levels. In this study, the highest mean pain score (1.06±1.083) reported was at the interval from 1 hour to 12 hours. Similar results were found in the study carried out by Mirhashemi et al.[4] The results of our study also showed that after 12 hours there was a decrease in pain score, as only 14.3% of the patients experienced pain in the time interval from 12 hours to 24 hours, and none reported pain in the duration from 24 hours to 1 week. But Mirhashemi et al.[4] reported that few patients experienced pain even at 24 hours and 1 week time period.

The limitation of our study is that the sample size was small and it was exclusively conducted at a single study centre. More studies with a greater sample size and including individuals from various settings can provide more reliable results.

CONCLUSION

This study concluded that the pain experienced after mini-screw insertion is significantly low. The greatest pain and discomfort are experienced in the time from 1-12 hours following insertion, after which it starts to decrease, and no pain is felt for 1 week post- surgically. There is no difference in gender with regard to the pain experienced after mini-screw insertion.

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DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

The ethical approval was provided by the Ethics Review Committee, Margalla Institute of Health Sciences, Rawalpindi (ERC Ref No: RA/39/18).

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AUTHORS CONTRIBUTION

Conception and design of the study: R. Arshad

Acquisition of data: R. Arshad

Analysis and interpretation of data: A. Mahmood

Drafting of the manuscript: R. Arshad

Critical review of the manuscript: A. Mahmood

Approval of the final version of the manuscript to be published: R. Arshad, A. Mahmood

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Assessing the Interrelationship of Obesity Indicators with Periodontal Health in a Cohort of Pakistani Population

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ABSTRACT

Objectives: Obesity is a growing public health concern worldwide, linked to various systemic diseases, including periodontitis. The study aims to evaluate the association between periodontitis and obesity using Body Mass Index and waist-hip ratio.

Materials and Methods: The study was conducted at Bahria University Dental College, recruiting 120 patients (72 females, 48 males) from the dental OPD. Participants were categorized into three groups based on their BMI: Normal, Overweight, and Obese. Periodontal parameters were measured and compared among these groups.

Results: It was observed that the majority of the obese subjects had PPD in the range of 0-3 mm while 9 of the obese subjects had pocket depth in the range of >3 mm and < 6 mm (p=0.02). The values of CAL were also observed more in obese subjects (p=0.01). The BOP was also positive in 23 obese subjects followed by 12 subjects in the overweight category (p=0.03). The calculus deposition and 4-5 mm pocket depth were also observed in 10 and 11 obese subjects, which is higher than the number observed in other groups (p<0.001). No statistically significant correlation between WHR was observed with PPD and BOP. However, CAL had a significant association with WHR (p=0.01). The correlation between CPI and WHR was also statistically significant (p=0.001).

Conclusion: The study demonstrates a positive association between markers of periodontal health and obesity. This suggests that obesity may be a potential causal factor in the development of periodontitis.

Keywords: Body-Mass Index, Obesity, Oral Health, Overweight, Periodontitis, Waist-Hip Ratio.

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INTRODUCTION

Obesity and periodontitis are among the common non-communicable diseases. Both these diseases are a growing epidemic that has affected a large population in developed countries as well as third-world countries like Pakistan.[1] Obesity is a condition that is a cause of many chronic inflammatory diseases such as Diabetes Mellitus type II, hypertension, hyperlipidemia, arteriosclerosis, cardiovascular disorders, and cerebrovascular diseases.[2] Due to the increased use of processed food and sedentary lifestyle obesity has increased drastically in the last few years.[3] In 2014, the World Health Organization (WHO) estimated that around 600 million obese adults worldwide were obese.[4] Nearly a third of the world's population is now classified as overweight or obese. The incidence of obesity has increased after the COVID-19 pandemic which has increased the preference of working from home. The body-mass index (BMI) and Waist Hip Ratio (WHR) are usually considered for the measurement of obesity. In Asian countries, the threshold of BMI classified as obese is lower, as the complications caused by obesity have been observed at comparatively lower BMI values.[5] This can be attributed to the diversity in culture, ethnicity, the geography of different regions, social and economic conditions, and degree of urbanization.

Obesity is associated with many systemic disorders and predisposes a person to a variety of dental problems as well.[6] It is considered a predisposing factor for periodontitis. Periodontitis is a prevalent oral condition in Pakistan that inflames the supporting tissues around the tooth and in severe cases leads to tooth loss.[7] The stimulation of the defensive host immune system damages the tissues leading to the synthesis and release of cytokines, proinflammatory mediators and metalloproteinases.[8] It has been reported that obesity modulates the host immune response which results in an increased susceptibility to infections.[9] Adipose tissues release certain pro-inflammatory cytokines, known as adipocytokines, which induce inflammatory processes and oxidative stress disorders. These adipocytokines can further trigger the inflammatory process in the periodontium and lead to delays in the wound healing process.[10] While existing studies have primarily explored the connection between obesity, increased BMI and periodontitis, this research uniquely contributes to the field by incorporating WHR as an additional parameter.[11] It has also been reported that obesity, weight gain, overweight and large waist circumference may be a risk factor or maybe a worsening factor for periodontal disease and may also negatively impact the outcome of periodontal therapies.[12]

Obesity is a growing problem in Pakistan and the data assessing the relationship between obesity and oral health in the Pakistani population is very scarce.[13] Shah et al.[14] reported a significant correlation between increased BMI with increased clinical attachment loss (CAL).

It is important to assess this relationship between obesity and the progression of periodontal disease to control and limit the pathological changes in the periodontium at an early stage. The research question for this study is "Is there a significant association between obesity, measured by BMI and WHR, and the progression of periodontitis in a cohort of the Pakistani population." Therefore, this study aims to assess whether obesity is a risk factor for the development and progression of periodontitis in the Pakistani population and whether BMI and WHR can be used as reliable indicators of this relationship.

MATERIALS AND METHODS

The study was conducted in the Dental OPD of Bahria University Dental College (BUDC), Bahria University Health Sciences Campus (BUHSC), Karachi from March 2022 to August 2022. The study was approved by the Ethical Review Committee of BUHSC, Karachi (ERC: 16/2020). The design of the study was a cross-sectional analytical group comparative design. The sample size was calculated using Sample Size Software (PASS v 11.0). The probability for rejecting the null hypothesis (α) was 0.05 with the power of the study at 80%, type II error (β) was 0.20 and the expected correlation coefficient (r) was 0.35. The total sample size was calculated as 110 subjects. For this study, we have taken 120 subjects with 40 subjects in each group. The purposive sampling technique was employed. In this study, we established specific inclusion and exclusion criteria to ensure the relevance and reliability of our research findings. Inclusion criteria encompassed participants within the age range of 20 to 60 years who provided written informed consent and were in good systemic health. Furthermore, eligible participants had to possess a minimum of 10 teeth in their oral cavities and were categorized based on Body Mass Index (BMI), specifically as Normal (18-22.9 kg/m^2),

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Overweight (23-25.9 kg/m^2), or Obese (>26 kg/m^2). Those falling within the third group exhibited a waist-hip ratio (WHR) exceeding >0.90 for males and >0.85 for females.

Participants who declined to participate were naturally excluded from the study, as were those with BMIs categorized as less than normal (<18kg/m^2). Additionally, individuals with uncontrolled systemic conditions such as diabetes, chronic renal failure, or hypertension were excluded, as were those who had taken antibiotics within the past 3 months or undergone periodontal treatment within the previous 6 months. Participants with fewer than 10 teeth in their oral cavities, a history of addiction, including smoking, areca nut, betel quid, naswar chewing, or those ladies who were pregnant or lactating, were also excluded. Lastly, individuals actively engaged in a weight loss program were not considered within the scope of this study.

Ethical approval was obtained from the Ethical Review Committee of Bahria University Health Sciences. The participants were recruited from the Department of Oral Diagnosis of the Dental OPD of BUDC. Patients were briefed about the aims and potential risks of the study. Participants fulfilling the eligibility criteria were recruited for the study and written consent was obtained. In the first stage of the study, a structured questionnaire consisted of three components. The first part consists of sociodemographic details e.g., age, gender, occupation, residence, and income. The socioeconomic status was determined based on the income of the family and occupation. The second part consists of medical and dental history and the third part consists of examinations i.e., BMI, WHR, clinical periodontal markers i.e., bleeding on probing (BOP), community periodontal index (CPI), clinical attachment loss (CAL) and periodontal pocket depth (PPD).

The examiners recorded the general sociodemographic details along with medical and dental history; followed by the calculation of BMI following the criteria for the South Asian population as normal weight (BMI: 18-22.9 kg/m^2), overweight (BMI: 23- 25.9kg/m^2), and obese (BMI >26kg/m^2) as well as WHR [WHR >0.90 (males), >0.85 (females)].[4] BMI was calculated using the formula body weight in kilograms (kg) divided by the square of the body height in meters (m^2) and was further confirmed by using the online Android application "BMI Calculator" (Appovo-Germany).

WHR was computed by dividing the waist measurement by the hip measurement (W/H). Body weight was measured using a digital weighing machine. Standing body height was measured from the shoulders in a relaxed posture with arms hanging freely, utilizing a measuring tape.

Intra-oral examination was performed, which involved assessing the presence or absence of bleeding on probing (BOP) within 10 seconds after probing, as well as recording clinical attachment level (CAL), Community Periodontal Index (CPI), and pocket probing depth (PPD). CAL and PPD were calculated using the WHO Periodontal Probe while CPI and BOP were evaluated using the CPITN probe. BOP was evaluated at six specific sites on each tooth in the oral cavity, excluding third molars, including the mesiobuccal, buccal, distobuccal, disto-lingual, lingual, and mesio-lingual sites. Before commencing the study, the researchers underwent calibration by conducting clinical periodontal measurements on a sample of 10 patients diagnosed with inflammatory periodontal disease (kappa = 0.85).

Data analysis was done by SPSS version 23. To assess data normality, the Shapiro-Wilk test was employed. Categorical variables were analyzed using the Chi-Square test, and correlations between BMI, WHR, and periodontal parameters were determined through Spearman's correlation analysis.

RESULTS

Table 1 shows the demographics of the study participants. There were more female participants (53.3%) as compared to males (46.6%). Most of the subjects belonged to middle socio-economic status (40%) and 38.8% of the subjects were educated up to graduate level.

Table 1: Descriptive statistics of the study participants

Gender	Frequency	Percentage
Male	63	46.60%
Female	87	53.30%
Socio-economic Status		
High	19	12.6%
Middle	55	36.6%
Low	76	50.6%
Education		
Secondary	54	36.0%
Intermediate	40	26.6%
Graduate	35	23.3%
Post-Graduate	21	14.0%

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Table 2 includes the information about the dental history of the patients. It was observed that most of the subjects brushed either once (35.5%) or twice (43.33%) a day maintaining good oral hygiene. The frequency of dental visits in 50% of the subjects was greater than 6 months and the most frequent type of treatment was scaling and polishing.

Table 2: Dental History of the Patients

Brushing	**Frequence**	**Percentage**
No Brushing	11	12.22%
Once	32	35.55%
Twice	39	43.33%
Thrice	8	8.88%
Dental Visit		
Never	17	18.88%
Less Than 6 months	28	31.11%
Greater than 6 months	45	50%
Dental Treatment		
Scaling/Polishing	45	50%
Extractions	8	8.88%
Tooth Fillings	17	18.88%
None	20	22.22%

Table 3 shows the BMI, WHR and periodontal parameters of the subjects. The subjects were equally divided into 3 groups based on their BMI. The WHR was low in 35.5% of the subjects and high in 33.3% of the subjects. The PPD of 61.1% of the subjects was in the range of 0-3 mm while 22.2% had PPD >6mm. The CAL in 54% of the subjects was in the range of 0-3 mm and 26.6% of the subjects had CAL in the range of 4-5mm. BOP was present in 53.3% and absent in 46.6% of the subjects. The CPI values showed that 24.4% of the subjects had healthy periodontium while 22.2% of the subjects had a pocket depth of 4-5 mm. Bleeding and calculus deposition was observed in 15.5% and 14.4% of the subjects respectively.

Table 4 shows the correlation of BMI and WHR with the periodontal parameters of the subjects. A statistically significant correlation was observed in all the periodontal parameters which shows that periodontal parameters are affected by weight gain.

Table 3: Descriptive statistics of BMI, WHR and periodontal parameters

Body-Mass Index (BMI)		
Normal	50	33.33%
Overweight	50	33.33%
Obese	50	33.33%
Waist to Hip Ratio (WHR)		
Low	52	35.55%
Moderate	48	31.11%
High	50	33.33%
Periodontal Probing Depth (PPD)		
0-3 mm	55	36.6%
>3mm-<6 mm	45	30.0%
>6mm	50	33.3%
Clinical Attachment Loss (CAL)		
0-3 mm	49	32.6%
4-5 mm	57	38.0%
6-8 mm	44	29.3%
Bleeding on Probing (BOP)		
Present	78	53.33%
Absent	72	46.66%
Community Periodontal Index (CPI)		
Healthy	57	14.44%
Bleeding	53	15.55%
Calculus	68	24.44%
4-5 mm Pocket	36	22.22%
>5 mm Pocket	33	13.33%

Table 4: Correlation between BMI, WHR and Periodontal Parameters

		BMI	**WHR**	**PPD**	**CAL**	**BOP**	**CPI**
Spearman's correlation	**BMI**	1.000	.517**	.316**	.390**	-.321**	.518**
	WHR	.517**	1.000	.299**	.318**	-.204*	.510**
	PPD	.316**	.299**	1.000	.809**	-.315**	.659**
	CAL	.390**	.318**	.809**	1.000	-.300**	.761**
	BOP	-.321**	-.204*	-.315**	-.300**	1.000	-.661**
	CPI	.518**	.510**	.659**	.761**	-.661**	1.000

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

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DISCUSSION

The current study evaluated the periodontal parameters and studied their relationship with obesity in a sample of the Pakistani population which was measured using BMI and WHR. The subjects were selected from the patients reporting to the Department of Periodontology of Bahria University Dental College. Obesity is a known factor for causing chronic periodontitis but the causal relationship between obesity and periodontitis is unknown. It is believed that the adverse effects of obesity on periodontium may be caused by impaired glucose metabolism, hyperlipidemia or increased levels of inflammatory molecules secreted by adipose tissues. Tumour necrosis factor-alpha mediates the endotoxin injury in periodontal tissues. Adipose tissues release many of these molecules which can be a potential cause of damaging the periodontium leading to inflammation. TNF-alpha has also been reported to generate insulin resistance in body cells. Therefore, it can be considered a potential cause of periodontal inflammation. The prevalence of obesity in Pakistan is increasing with a sedentary lifestyle and the use of fast food. Particularly, since the onset of the pandemic and the increase in the tendency of the "work-from-home" policy of many companies has further increased the incidence of obesity in people. BMI is reported to be the most common parameter for evaluating obesity. However, it considers height and does not give a true picture of body fat. Waist circumference and WHR help in determining abdominal adiposity. The upper abdominal fat is considered more detrimental in comparison to lower body fat. Therefore, both parameters were considered for this study. The results of the current study show a strong association between the presence of periodontitis and obesity. The PPD was measured in all the subjects, and it was observed that severe PPD was present in overweight and obese subjects. A higher prevalence of periodontitis in obese subjects has been reported in different populations such as Japanese,[15] Koreans,[16] and Iraqi[17] population as well. The severity of pocket depth statistically significantly increased in overweight and obese subjects. This is also in line with other studies which observed severe PPD in obese and overweight subjects. Thomas et al. however reported no association between obesity and periodontitis.[18] Similar results have been observed in subjects with high and moderate WHR. The severity of periodontitis was statistically significantly associated with increased WHR. The findings were in line with the results of Ganesan et al. who also reported that high WHR is associated with an increased prevalence of obesity.[19]

The CAL was also measured, and it was observed that moderate and severe CAL were present in overweight and obese subjects while the normal individuals had limited or mild CAL. CPI also indicates severe periodontitis in obese subjects. Moderate CAL was observed in subjects having moderate and high WHR. The CPI index also showed a statistically significant association with obese and overweight subjects and subjects having moderate to high WHR. These findings are in accordance with many other studies which confirm that obese subjects are more prone to periodontitis and the severity may increase with increased body fat.

Chachar et al. also reported that overweight and obese subjects are prone to periodontal diseases and the prevalence is quite high in female obese subjects.[20] Mazhar et al.[21] and Ataullah et al.[22] also established a positive association between obesity and periodontal health of the subjects' particularly old obese subjects are strongly influenced. A recent study conducted in a tertiary care hospital in Karachi established a significant positive correlation between BMI and the severity of periodontitis.[23]

Different clinical trials have been conducted to evaluate the effect of obesity on non-surgical periodontal treatment. Martinez et al.[24] Peralta et al.[25] and Osagbemiro et al.[26] reported that a negative effect is exerted on the non-surgical periodontal treatment outcomes in obese subjects.

In this study, we did not consider many other factors such as gender, age, smoking status and other risk factors which lead to periodontitis. This study was a single-center study which is another limitation. The sample size was also small. Further studies need to be conducted which should be multicentered, with a larger sample size and considering other risk factors that can lead to periodontitis. Other indices should also be used to indicate the presence and severity of periodontitis. Randomized controlled trials should also be undertaken to determine the effect of obesity and WHR on periodontal inflammation and treatment.

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CONCLUSION

In conclusion, this study found a strong association between obesity and periodontitis in the Pakistani population, as assessed by BMI and WHR. The severity of periodontal issues, including pocket probing depth (PPD), clinical attachment level (CAL), and the Community Periodontal Index (CPI), was notably higher in overweight and obese subjects. This research sheds light on the relationship between obesity and periodontitis, however, multicenter studies with larger sample sizes and consideration of additional risk factors are needed for a more comprehensive understanding. Randomized controlled trials would also help clarify the impact of obesity and waist-hip ratio on periodontal inflammation and treatment outcomes.

DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

Ethical approval was obtained by the Ethical Review Committee of Bahria University of Health Sciences (ERC number: 16/2020) according to the Declaration of Helsinki.

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CASE REPORT

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Neutral Zone Technique: Patient with a Severely Atrophic Mandibular Ridge

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ABSTRACT

One of the leading issues faced by prosthodontists today is making a prosthesis for a severely resorbed residual ridge. Ridge resorption is a multi-factorial process that is both irreversible and progressive. This condition causes a decrease in the occlusal vertical dimension, sulcular depth and an overall decrease in the lower facial height. To counter this issue, the neutral zone technique is used to construct a removable prosthesis. The aim is to strike a perfect balance between the forces of the lip, cheek, and buccal mucosa. The area where all these forces cancel out is called the neutral zone. Tooth placement is done in this region to achieve optimum stability of the prosthesis to aid in the lack of retention because of the resorbed residual ridge.

Keywords: Complete Denture, Neutral Zone, Atrophic Ridge, Denture Stability

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INTRODUCTION

Complete dentures aid in improving the quality of life. Losing teeth means losing the ability to masticate, encountering speech-related problems, and losing confidence in the overall facial looks.[1] Polymethyl methacrylate since its invention has been widely used in the fabrication of partial and complete dentures, occlusal splints, and implant overdentures.[2] Its ability to flow and adapt closely to a mold and replicate oral structures is what we need.

As deduced by various articles and reports on this subject, the prosthesis amalgamation relies on static, dynamic and hard and soft tissue factors with the distribution of forces among them.[3] Muscular balance is of utmost importance for achieving satisfactory masticatory function.[4] For the success of a dental prosthesis, mechanics, aesthetics and speech, all play a significant role.[3] Along with the associated structures, teeth volume, angulation and diameter are important parameters that aid in the balance of prosthesis.[6] The only plausible solution is a biomechanical device made considering all these factors, that works in harmony with the associated structures.[3,7-9]

A complex, biophysical process seen in edentulous patients with advancing age is residual ridge resorption.[10,11] Loss of ridge structure means loss of retention, and to make up for this, the neutral zone technique is applied.[10,11] A special impression is made

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that closely replicates and captures the movements of the lip, cheek, tongue, and buccal mucosa thereby, highlighting a small area where all forces are nullified, called the neutral zone (NZ).[11] A diverse range of mediums are used to record the NZ, for example, impression compounds, soft wax, tissue conditioners and impression plaster.[7] In this case report, an impression compound by Hiflex was used.

CASE REPORT

A 65-year-old male patient reported to the prosthodontics department of Islamic International Dental Hospital with the chief complaint of missing teeth and wanted an artificial replacement. On examination, the upper arch was dentate with only missing right molars, while the lower arch was edentulous with a severely resorbed ridge – Atwood classification Order 5 - low, well rounded (figure 1). Treatment options included conventional complete denture prosthesis and implant-supported prosthesis. However, the treatment plan finalized in this case was to construct a single conventional complete denture using the neutral zone technique.

After obtaining the consent, primary impressions were made in stock trays. Alginate was used for the upper arch and impression compound for the lower edentulous arch. Primary casts were made with dental stone. The custom tray with a handle was fabricated using self-curing acrylic, well adapted to the lower ridge. It was used for the border molding of the mandibular arch with the low-fusing impression compound – green stick. Zinc oxide eugenol was used to make the secondary impression. Master casts were poured in dental stone and the record base constructed with wax was processed with heat-cure acrylic to improve the record base stability. The wax occlusal rim was made on the heat-cured baseplate.

The mandibular record base was inserted in the patient's mouth, and various tongue movements were performed by the patient to assess the marginal extensions and stability.

Vertical jaw relation was performed by adjusting the occlusal surface of the mandibular rim. The patient was asked to sit in an upright position followed by marking two points on the patient's face – one point on the nose and one on the chin. The OVD was determined to be 50mm and RVD was set at 53mm with a freeway space of 3mm. Labial fullness and other parameters defining facial aesthetics were kept in consideration while adjusting the rim and establishing the vertical relationship. At last, the lower rim was secured with the upper dentition in centric relation.

The cast of the upper arch and the lower baseplate were articulated on a semi-adjustable articulator at a recorded centric relation. The lower rim was removed from the baseplate and a wire framework was shaped projecting towards the upper arch, to help with the retention of low-fusing compound. Acrylic bite blocks were made at the molar region to maintain the vertical relation (figure 2a).

The type 1 – low-fusing impression compound was softened in a water bath and adapted to the wire framework. The baseplate was inserted in the patient's mouth and routine mandibular movements like swallowing, sucking of lips and pronouncing vowels were performed. This aided in molding the impression compound into the neutral zone space (figure 2b). The location of the NZ is not affected by the material used in recording it.[12]

The baseplate was mounted back on the articulator. Plaster indices surrounding the NZ impression were made on the cast. Three notches: two in posterior and one in anterior region were added (figure 2c). A separating media was applied on the cast, record base and over the NZ recorded. Dental plaster was poured up to the top of the compound margins and worked into the notches of the base. The plaster indices were divided into two buccal and one lingual segment to guide the removal and placement of these indices (figure 2d). The NZ record was then removed, and acrylic bite blocks were removed from the denture base. Indices were reassembled and wax was poured into the space representing the neutral zone. Finally, the mandibular teeth were arranged on the rim in between the indices while establishing an occlusion with the maxillary dentition (figure 2e).

A wax try-in was performed and record base stability, aesthetics, and intra-oral occlusion were evaluated. All movements done while recording the NZ were reperformed by the patient successfully (figure 2f). The trial dentures were then processed with a heat-cure acrylic resin and lightly polished.

The denture was inserted, and retention, stability, and

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Figure 1 – Atrophic mandible

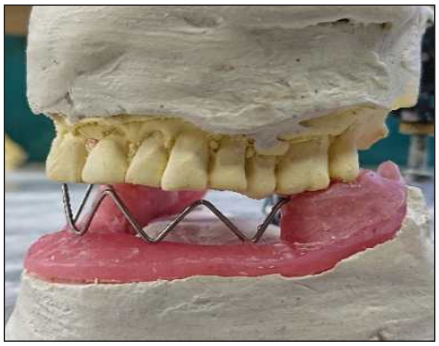

Figure 2A – wire framework and acrylic stops

Figure 2B– neutral zone recorded

Figure 2C – notches on base

Figure 2D– after boxing

Figure 2E – tooth setup in neutral zone

Figure 2F– wax try-in denture

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Figure 3 – Denture insertion

occlusion were verified. High spots were trimmed off and the patient was comfortable with the prosthesis. Post-op instructions were given, and the patient was kept on follow-up to address any complaints about the use and function of the new prosthesis (figure 3).

DISCUSSION

Research has determined that NZ is a sensitive indicator of instability, thus, arranging denture teeth accordingly helps to achieve maximum stability of the prosthesis.[13] Even forces also minimize the resorption of the residual alveolar ridge.[14] The surrounding muscles that affect NZ are the buccinator, modiolus, orbicularis oris, mentalis, and tongue muscles.[5] During the impression, the patient is asked to whistle, protrude their tongue, purse their lips, suck, and grin to effectively record all biomechanical movements.[12,15]

Dentures, especially in patients with compromised ridges need to be fabricated in a manner that they do not interfere with the normal neuromuscular activity.[5,16] This case report has documented the fabrication of a single complete removable denture for a patient with a severely resorbed mandibular ridge using the neutral zone technique. On delivery of the denture to the patient after processing and polishing, it showed adequate retention and stability due to a balanced muscular activity. The speech produced was also closer to the normal.[17] It had a profound influence on the patient's masticatory function with enough tongue space and prevention of food impaction.[18] This technique provides a solution for patients with highly resorbed ridges to function normally.

This case report uses conventional methods to record NZ. The use of CAD-CAM to construct record bases in clinical practice can make this approach more effective due to their close adaptation to the tissue surface and result in fewer chances of human errors.[5] The use of digital technologies like VR has also shown significant satisfaction among doctors in diagnosing and treatment planning of complex cases.[19]

CONCLUSION

The neutral zone technique is a relatively simpler method that adds just one extra clinical step but ensures a stable and long-term retentive prosthesis. However, incorporating advanced methods in recording NZ in clinical practice can further increase patient satisfaction.

DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

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An abstract (no longer than 250 words) and 3-6 relevant keywords (in alphabetical order) are required for the following article categories: Original Articles, Narrative Reviews, Systematic Reviews and Meta-analysis. For Case Reports and Short Communications, an abstract should be no longer than 150 words and 3-6 relevant keywords.

Abstracts for Narrative Reviews, Case Reports, and Short Communications should be unstructured (in one single paragraph with no section headings), and include information on the background/purpose of the report, methods, results (or case report), and conclusions.

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