Original Article

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Orthodontic Practice in the Times of COVID-19 Pandemic: An Online Survey

Dentistry Section

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ABSTRACT

Introduction: Coronavirus Disease 2019 (COVID-19) pandemic is not the first one which the globe has faced but never came across a health crisis that moved so quickly across continents. COVID-19 outbreak presently posed a very serious threat to the existence of mankind on earth. The massive impact of COVID-19 pandemic was evident in all aspects of life-personal, social as well as professional. The field of dentistry including orthodontics was no exception to this.

Aim: To describe the impact of COVID-19 pandemic on orthodontic practice, exploring the basic sterilisation protocols being followed during COVID-19 pandemic and to predict the future of orthodontics in post-COVID era.

Materials and Methods: The Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dental Sciences, SGT University, Gurugram, Haryana, India, conducted this questionnaire based cross-sectional survey in May 2020 over a time span of 20 days. A web-based questionnaire of 15 multiple choice questions in English was created as a Google Form in Google Documents. The link to this form was shared online with the orthodontists and postgraduate students (Orthodontics) of dental colleges situated in the National Capital Region (NCR) through WhatsApp groups and e-mails. A total of 254 responses were received.

Results: A 97.6% of respondents agreed that COVID-19 affected their orthodontic practice. The odds ratio between those not likely to resume practice and those likely to resume practice taking educational qualification as the significant predictor was calculated to be 8.976 at 95% confidence intervals. There was wide variation in the selection of the safety protocols by the orthodontists in the present study ($p<0.01$). Increased digitalisation in orthodontics (45.7%) followed by less demand of orthodontic treatment (18.5%) were opted as the future in post-COVID era ($p<0.01$).

Conclusion: The present survey found that orthodontic community as a whole was affected greatly by COVID-19 pandemic and is quite apprehensive. The future of orthodontics in the post-COVID era is unpredictable presently. Digitalisation in orthodontics is the key option to have minimum physical contact with the patients. The study suggested the need and importance of basic sterilisation protocols and a training program for dental settings during COVID-19 for patient's as well as clinician's safety.

Keywords: Dental professionals, Pandemic, Personal protective equipments, Sterilisation protocols

INTRODUCTION

Coronavirus Disease (COVID-19) outbreak is one of the most deadliest pandemics that the world has faced till now. COVID-19 disease caused by SARS-COV-2 virus emerged as a challenge for the governments as well as medical fraternity throughout the globe [1,2]. World Health Organisation (WHO) declared COVID-19, a public health emergency on January 30, 2020 [3].

A mild to severe respiratory illness caused by the Coronavirus gets transmitted by respiratory droplets characterised by fever, cough and shortness of breath may progress to pneumonia or Acute Respiratory Distress Syndrome (ARDS) [4]. The chances of developing serious illness in older patients with health related issues like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are very high. Notably, 80% of the patients have only mild flu-like symptoms and seasonal allergies, which might lead to an increased number of undiagnosed cases [5]. It is known to be highly transmissible when patients are most symptomatic. Incubation period can range from 2 to 14 days; hence transmission can occur before any symptoms become apparent. These asymptomatic patients can act as "carriers" and also serve as reservoir for re-emergence of infection [6].

The COVID-19 spread exponentially is leading to a global public health crisis. Various studies were conducted to check the efficacy of existing drugs like hydrochloroquine and other treatment strategies in the treatment of COVID-19 positive patients. Scientists and researchers throughout the world struggled hard to find a vaccine against this deadly Coronavirus to finally achieve success recently [7-9]. Specific guidelines for health workers on basic sterilisation protocols, use of Personal Protective Equipments (PPEs), N95 masks, face shields etc., have been suggested and constantly being updated by WHO, Centers for Disease Control and Prevention (CDC) and Indian Council of Medical Research (ICMR) in India [10-12].

The massive impact of COVID-19 pandemic was evident in all aspects of life; personal, social as well as professional disrupting the entire health, economic and social framework of the whole world [13]. The field of dentistry including orthodontics was no exception to this. In fact, the dentists are at the greatest risk of exposure to pathogenic microorganisms, including viruses and bacteria that infect the oral cavity [14]. Indian Dental Association (IDA) and Indian Orthodontic Society (IOS) issued guidelines to the dentists and orthodontists to restrict dental operations to emergency and urgent treatment procedures only after teleconsultation, and through prefixed appointment with all the necessary standard precautions [15,16].

In the present scenario, the fear of orthodontists might be decreased demand of braces neither being any emergency nor an urgency among the general public in developing country like India. Also, an additional financial burden of upgrading the clinical set-up and following all the necessary standard protocols to ensure safety of patients as well as dental professionals was a big worry. Dentists should understand the moral responsibility to prevent the spread among the patients in spite of the financial consequences [17].

Many studies have been published highlighting preappointment tele-triage, available sterilisation protocols and how to deal with different orthodontic emergencies at home or in office during COVID-19 pandemic [18,19]. A few studies are available on the impact perceived

by the orthodontists on ground [20]. The present study is novel as it tried to identify how severely COVID-19 affected orthodontic practice, whether sterilisation protocols being advertised are being followed or not and what are the fears in the minds of orthodontic community.

This paper was an attempt to describe the impact of COVID-19 on orthodontic practice, exploring the basic sterilisation protocols being followed during the COVID-19 pandemic and to predict the future of orthodontics in the post-COVID era.

MATERIALS AND METHODS

The Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dental Sciences, SGT University, Gurugram, Haryana, India, conducted this questionnaire based cross-sectional survey in May 2020 over a time span of 20 days.

Inclusion and Exclusion criteria: Inclusion criteria were orthodontists and postgraduate students (Orthodontics) of dental colleges situated in the NCR and the exclusion criteria were non orthodontic professionals. A list of total of 360 faculty members and postgraduates of orthodontic departments of the colleges of the NCR region was generated as a whole sample.

Questionnaire: A web-based questionnaire consisting of 15 multiple choice questions was created as a Google Form in Google documents (https://docs.google.com/forms/d/e/1FAIpQLSfvp5KdcV_l21Dn6iGvmEfpQp8cEAlYYwmrfsVuqaIpnCO0yA/viewform?usp=sf_link) [Annexure-1].

The questionnaire was designed on the basis of objectives of our survey. Multiple choice questions included three parts:

- The first part was related to demographic data (Type of practice, years of practice) and effect of COVID-19 on orthodontic practice.
- Second part consisted of questions to assess the knowledge of basic sterilisation protocols being followed among orthodontists during the COVID-19 pandemic.
- Third part consisted of questions regarding future of orthodontics in post-COVID era in India.

The pilot study with the same questionnaire was conducted on 20 faculty members and postgraduates of our Department of Orthodontics, Faculty of Dental Sciences, SGT University and the Cronbach's alpha value recorded was 0.87 indicating an acceptable level of reliability of the survey questionnaire.

The link to this form was shared online with the list of 360 Orthodontists and postgraduate students (Orthodontics) of dental colleges situated in the NCR through WhatsApp groups and e-mails. Personal e-mails were obtained from Departments of Orthodontics of Dental Colleges situated in the NCR.

An introduction at the beginning of the questionnaire stating the purpose of the study and acceptance to participate was considered as consent and no incentives were given to the respondents. Confidentiality and anonymity were confined so that responses cannot be linked to individual participants.

A total of 254 responses were received for this online survey form link active for 20 days only with a response rate of 70.5%. [Table/Fig-1] shows the distribution of responses received into groups on the basis of educational qualification/designation and years of experience.

STATISTICAL ANALYSIS

Data collected was tabulated using Microsoft excel and analysed using Statistical Package for Social Sciences (SPSS) version 20. (IBM SPASS statistics, IBM corp. Armonk, NY, USA released 2011). Descriptive statistics of the explanatory and outcome variables was calculated by mean and standard deviation for quantitative variables. Frequency and proportion was calculated for qualitative variables. Chi-Square/Fisher Freeman Halton test by cross tabulation was used to compare frequencies. Binominal and Multinominal logistic regression analysis was carried out at 95% Confidence Intervals to identify variables affecting the responses to questions. Any p-value less than 0.05 were considered to be significant for all analyses (two-tailed).

According to educational qualifications/designation		
Educational qualification	**Number**	**Percentage (%)**
Pursuing MDS in Orthodontics (Postgraduates)	128	50.4
Completed MDS in Orthodontics	126	49.6
1. Private Practitioner/Consultant	74	29.1
2. Academician (Private)	40	15
3. Academician (Government)	12	4.7
Total	254	100
According to years of experience		
Years of experience	**Number**	**Percentage (%)**
<5 years	146	57.5
5-10 years	53	20.9
11-15 years	19	7.5
>15 years	36	14.1
Total	254	100

[Table/Fig-1]: Distribution of study subjects.

RESULTS

Participants of this survey were between the age ranges of 23 to 58 years with varying clinical experience from less than 5 years to more than 15 years. A 50.4% of the respondents were pursuing postgraduation and 49.6% were academicians and clinicians/consultants. [Table/Fig-2] shows the responses of study subjects to different questions under different subheadings:

a) The effect of COVID-19 on orthodontic practice.

b) The sterilisation protocols being followed during COVID-19 outbreak.

c) The future of orthodontic practice in post-COVID era.

Questions	Responses	Number	Percentage (%)
a) Effect of COVID-19 on orthodontic practice			
Has COVID-19 affected your orthodontic practice?	Yes	248	97.6
	No	6	2.4
Do you feel it is safe to resume your orthodontic practice in the current situation?	Yes	36	14.2
	No	159	62.6
	Can't say	59	23.2
In your practice, most of the patients require orthodontic treatment primarily for	Aesthetics	179	70.5
	Functional problems	7	2.7
	Growth modification	2	0.8
	Combination	66	26.0
Is your staff willing to work in such conditions?	Yes	89	35.0
	No	70	27.6
	May be	95	37.4
b) Sterilisation protocols being followed during COVID-19			
What all safety protocols will you follow/are following in your orthodontic set up?	PPEs (Disposable), N95 masks, eye glass protectors	27	10.6
	PPEs (Disposable), N95 masks, Face shield	33	13.0
	PPEs (Disposable) with hood and shoe covers, N95 masks, eye glass protectors	56	22.0
	Autoclavable surgical coveralls, head caps, shoe covers, surgical masks, Face shields	45	17.8
	PPEs (Disposable) with hood and shoe covers, N95 masks, Face shields	93	36.6

Which basic qualities one should check while buying PPEs/autoclavable coveralls?	High GSM, SITRA approval	22	8.6
	High GSM, non-woven, laminated, taped, waterproof	23	9.1
	Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class 3 exposure press or equivalent	31	12.2
	High GSM, SITRA approval, Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class 3 exposure press or equivalent	178	70.1
Can N95 mask be reused?	Yes	149	58.7
	No	66	26.0
	Can't say	39	15.3
What basic precautions/ measures will you take/ are taking to prevent aerosol generation in your orthodontic practice?	Just Avoid using air rotor, ultrasonic scaler and 3-way syringe	102	40.1
	Use of micromotor and hand scaler with irrigation with syringe	23	9.1
	Use of handpiece with anti-retraction valves with Extraoral high volume suction	12	4.7
	HEPA filter along with Use of handpiece with anti-retraction valves with Extraoral high volume suction	62	24.4
	Aerosol generating procedures done in Isolation negative pressure operatory/ Airborne Infection Isolation Rooms (AIIRs)	55	21.7
Managing Biomedical Waste Management (BMW) of PPEs will be?	Easy	28	11.0
	Difficult	175	68.9
	No idea	51	20.1
c) Future of orthodontic practice in post-COVID era			
Do you think that the cost of dental materials/equipments and orthodontic treatment is going to increase post-COVID?	Yes	223	87.8
	No	13	5.1
	No idea	18	7.1
According to you, who will bear the additional cost of extra safety protocols?	Patient	61	24.0
	Orthodontist	37	14.5
	50% Patient + 50% Orthodontist	150	59.1
	Others	06	2.4
Which treatment modality is preferable in post-COVID era?	Fixed orthodontic treatment	57	22.4
	Functional/Orthopaedic appliances	04	1.6
	Removable orthodontic appliances	06	2.4
	Clear aligners	110	43.3
	Combination	77	30.3
In your opinion, what could be the future of orthodontics in developing countries like India in the post-COVID era?	Less demand of orthodontic treatment	47	18.5
	Same as before the COVID-19 pandemic outbreak	45	17.7
	Increased digitalisation in orthodontics	116	45.7
	Can't say	31	12.2
	Both Option 1 and 3	15	5.9

[Table/Fig-2]: Responses of study subjects.

Taking consideration of orthodontic treatment objectives, 70.5% orthodontist reported aesthetics and 26% ticked multiple options of aesthetics, functional problems, growth modification and other difficulties like Temporomandibular Disorders (TMDs). Willingness of the staff to work in the present Corona times was questionable due to fear of life on one hand and earning livelihood on the other. A 35% of responses reported that the staff was ready to work; but 27.6% denied and 37.4% had no idea. About 36.6% of the respondents selected the option of PPEs (disposable) with hood and shoe covers, N95 masks, face shields followed by 22% who preferred eye glass protectors in place of face shields and 17.7% adopted autoclavable surgical coveralls, head caps, shoe covers, surgical masks, face shields [Table/Fig-2]. Increased digitalisation in orthodontics (45.7%) followed by less demand of orthodontic treatment (18.5%) were opted as the future in post-COVID era ($p<0.01$).

The most common modality selected overall as well as by all groups in all categories was clear aligners (43.3%) followed by combination of different modalities depending upon malocclusion (30.3%), fixed orthodontic treatment (22.4%), removable orthodontic appliances (2.4%), functional/orthopaedic appliances (1.6%).

[Table/Fig-3] shows the comparison of responses of study subjects based on educational qualification. There was wide variation in the selection of the safety protocols by the orthodontists in the present study ($p <0.01$). [Table/Fig-4] depicts the comparison of responses of study subjects based on years of experience.

[Table/Fig-5] shows Binominal and Multinominal logistic regression analysis carried out at 95% Confidence intervals to identify variables affecting the responses to questions. The odds ratio between those not likely to resume practice and those likely to resume practice taking educational qualification as the significant predictor was calculated to be 8.976 at 95% confidence intervals indicating that for every unit increase in educational qualification the odds of person resuming practice changed by a factor of 8.976.

DISCUSSION

Dentistry in Corona times is shut down in most parts of the country and will not come back soon as "usual." The current survey was done to evaluate the dilemma of orthodontic practice in the times of Corona. The COVID-19 pandemic has shattered the economy of almost the entire world [13]. A 97.6% of the respondents to this survey agreed that COVID-19 has affected their orthodontic practice. All groups (based on designation, educational classification or clinical experience) have been largely affected by this deadly pandemic. Isiekwe IG et al., reported in their study that pandemic had a negative social, economic and psychosocial impact on orthodontist's life [20].

Guo H et al., found that at the beginning of the COVID-19 outbreak, 38% fewer patients visited the dental offices [21]. The findings highly recommend that COVID-19 had greatly impacted dental patients' behaviour. Cotrin P et al., concluded that the COVID-19 pandemic and the quarantine duration had a great impact on orthodontic appointments and patient's anxiety [22]. Shenoi SB et al., revealed that orthodontic patients were also affected due to inaccessibility of orthodontists and recommended that orthodontic patients should be given mental support by the orthodontic professionals [23].

The present survey findings showed that 62.6% did not feel that it was safe to resume their orthodontic practice in the COVID-19 outbreak and 23.2% were confused about it. Odds Ratio of 8.976 shows that the odds of resuming practice were higher among those who completed MDS when compared to those who were pursuing MDS. Private practitioners/consultants were more likely to resume their orthodontic practice than other groups, the reason might be the financial implications ($p<0.01$).

The reason for this could be attributed to the high vulnerability risk for the dental team as well as patients as ACE-2 receptors expressed on oral cavity mucosa binds to SARS-CoV-2 viral spike

Questions	Responses	Pursuing MDS n (%)	Completed MDS n (%)	Chi-square p-value
Has COVID-19 affected your orthodontic practice?	Yes	124 (96.9)	124 (98.4)	0.689
	No	04 (3.1)	02 (1.6)	
Do you feel it is safe to resume your orthodontic practice in the current situation?	Yes	09 (7.0)	27 (21.4)	0.02*
	No	91 (71.1)	68 (54.0)	
	Can't say	28 (21.9)	31 (24.6)	
In your practice, most of the patients require orthodontic treatment primarily for	Aesthetics	94 (73.4)	85 (67.5)	0.116
	Functional problems	05 (3.9)	02 (1.5)	
	Growth modification	02 (1.6)	00 (0.0)	
	Combination	27 (21.1)	39 (31.0)	
What all safety protocols will you follow/are following in your orthodontic set up?	PPEs (Disposable), N95 masks, eye glass protectors	12 (9.4)	15 (11.9)	0.019*
	PPEs (Disposable), N95 masks, Face shield	12 (9.4)	21 (16.7)	
	PPEs (Disposable) with hood and shoe covers, N95 masks, eye glass protectors	35 (27.3)	21 (16.7)	
	Autoclavable surgical coveralls, head caps, shoe covers, surgical masks, Face shields	16 (12.5)	29 (23)	
	PPEs (Disposable) with hood and shoe covers, N95 masks, Face shields	53 (41.4)	40 (31.7)	
Which basic qualities one should check while buying PPEs/ autoclavable coveralls?	High GSM, SITRA approval	07 (5.5)	15 (11.9)	0.001**
	High GSM, non-woven, laminated, taped, waterproof	04 (3.1)	19 (15.1)	
	Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class 3 exposure press or equivalent	15 (11.7)	16 (12.7)	
	High GSM, SITRA approval, Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class 3 exposure press or equivalent	102 (79.7)	76 (70.3)	
Can N95 mask be reused	Yes	66 (51.6)	83 (65.9)	0.019*
	No	35 (27.3)	31 (24.6)	
	Can't say	27 (21.1)	12 (9.5)	
What basic precautions/ measures will you take/are taking to prevent aerosol generation in your orthodontic practice?	Just Avoid using air rotor, ultrasonic scaler and 3-way syringe	34 (26.6)	68 (54.0)	0.001**
	Use of micromotor and hand scaler with irrigation with syringe	14 (10.9)	09 (7.1)	
	Use of handpiece with anti-retraction valves with Extraoral high volume suction	06 (4.7)	06 (4.8)	
	HEPA filter along with Use of handpiece with anti-retraction valves with Extraoral high volume suction	36 (28.1)	26 (20.6)	
	Aerosol generating procedures done in Isolation negative pressure operatory/Airborne Infection Isolation Rooms (AIIRs)	38 (29.7)	17 (13.5)	
Managing Biomedical Waste Management (BMW) of PPEs will be?	Easy	11 (8.6)	17 (13.5)	0.327
	Difficult	88 (68.7)	87 (69.0)	
	No idea	29 (22.7)	22 (17.5)	
Do you think that the cost of dental materials/equipm-entsand orthodontic treatment is going to increase post-COVID?	Yes	115 (89.8)	108 (85.7)	0.572
	No	05 (3.9)	08 (6.3)	
	No idea	08 (6.2)	10 (7.9)	
According to you, who will bear the additional cost of extra safety protocols?	Patient	19 (14.8)	42 (33.3)	0.007*
	Orthodontist	21 (16.4)	16 (12.7)	
	50% Patient + 50% Orthodontist	85 (66.4)	65 (51.6)	
	Others	03 (2.3)	03 (2.4)	
Is your staff willing to work in such conditions?	Yes	25 (19.5)	64 (50.8)	0.001**
	No	47 (36.7)	23 (18.3)	
	May be	56 (43.8)	39 (31.0)	
Which treatment modality is preferable in post-COVID era?	Fixed orthodontic treatment	28 (21.9)	29 (23.0)	0.695
	Functional/Orthopaedic appliances	03 (2.3)	01 (0.8)	
	Removable orthodontic appliances	03 (2.3)	03 (2.4)	
	Clear aligners	59 (46.1)	51 (40.5)	
	Combination	35 (27.3)	42 (33.3)	
In your opinion, what could be the future of orthodontics in developing countries like India in the post-COVID era?	Less demand of orthodontic treatment	19 (14.8)	28 (22.2)	0.119
	Same as before the COVID-19 pandemic outbreak	19 (14.8)	26 (20.6)	
	Increased digitalisation in orthodontics	64 (50.0)	52 (41.3)	
	Can't say	15 (11.7)	16 (12.7)	
	Both Option 1 and 3	11 (8.6)	4 (3.2)	

[Table/Fig-3]: Comparison of responses of study subjects based on educational qualification.
(p<0.05* statistically significant; p<0.001** statistically highly significant)

Questions	Responses	<5 years n (%)	5-10 years n (%)	11-15 years n (%)	>15 years n (%)	Chi-square p-value
Has COVID-19 affected your orthodontic practice?	Yes	143 (97.9)	50 (94.3)	19 (100)	36 (100)	0.274
	No	03 (2.1)	03 (5.7)	0	0	
Do you feel it is safe to resume your orthodontic practice in the current situation?	Yes	18 (12.3)	05 (9.4)	03 (15.8)	10 (27.8)	0.174
	No	98 (67.1)	33 (62.3)	11 (57.9)	17 (47.2)	
	Can't say	30 (20.5)	15 (28.3)	05 (26.3)	09 (25.0)	
In your practice, most of the patients require orthodontic treatment primarily for	Aesthetics	110 (75.3)	32 (60.4)	11 (57.9)	26 (72.2)	0.104
	Functional problems	05 (3.4)	01 (1.9)	01 (5.3)	0	
	Growth modification	0	02 (3.8)	0	0	
	Combination	31 (21.2)	18 (27.3)	07 (36.8)	10 (27.8)	
What all safety protocols will you follow/are following in your orthodontic set up?	PPEs (Disposable), N95 masks, eye glass protectors	12 (8.2)	12 (22.6)	0	03 (8.3)	0.133
	PPEs (Disposable), N95 masks, Face shield	19 (13.0)	07 (13.2)	03 (15.8)	04 (11.1)	
	PPEs (Disposable) with hood and shoe covers, N95 masks, eye glass protectors	39 (26.7)	07 (13.2)	05 (26.3)	05 (13.9)	
	Autoclavable surgical coveralls, head caps, shoe covers, surgical masks, Face shields	23 (15.8)	11 (20.8)	04 (21.1)	07 (19.4)	
	PPEs (Disposable) with hood and shoe covers, N95 masks, Face shields	53 (36.3)	16 (30.2)	07 (36.8)	17 (47.2)	
Which basic qualities one should check while buying PPEs/autoclavable coveralls?	High GSM, SITRA approval	09 (6.2)	07 (13.2)	02 (10.5)	04 (11.1)	0.408
	High GSM, non-woven, laminated, taped, waterproof	14 (9.6)	03 (5.7)	03 (15.8)	03 (8.3)	
	Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class 3 exposure press or equivalent	23 (15.8)	04 (7.5)	0	04 (11.1)	
	High GSM, SITRA approval, Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class 3 exposure press or equivalent	100 (68.5)	39 (73.6)	14 (73.3)	25 (69.4)	
Can N95 mask be reused	Yes	85 (58.2)	30 (56.6)	13 (68.4)	21 (58.3)	0.429
	No	34 (23.3)	15 (28.3)	04 (21.1)	13 (36.1)	
	Can't say	27 (18.5)	05 (15.1)	02 (10.5)	02 (5.6)	
What basic precautions/ measures will you take/ are taking to prevent aerosol generation in your orthodontic practice?	Just Avoid using air rotor, ultrasonic scaler and 3-way syringe	48 (32.9)	25 (47.2)	09 (47.4)	20 (55.6)	0.136
	Use of micromotor and hand scaler with irrigation with syringe	13 (8.9)	06 (11.3)	02 (10.5)	02 (5.6)	
	Use of handpiece with anti-retraction valves with Extraoral high volume suction	05 (3.4)	04 (7.5)	01 (5.3)	02 (5.6)	
	HEPA filter along with Use of handpiece with anti-retraction valves with Extraoral high volume suction	37 (25.3)	13 (24.5)	04 (21.1)	08 (22.2)	
	Aerosol generating procedures done in Isolation negative pressure operatory/Airborne Infection Isolation Rooms (AIIRs)	43 (29.5)	05 (9.4)	03 (15.8)	04 (11.1)	
Managing Biomedical Waste Management (BMW) of PPEs will be?	Easy	12 (8.2)	06 (11.3)	05 (26.3)	05 (13.9)	0.059
	Difficult	103 (70.5)	33 (62.3)	10 (52.6)	23 (80.6)	
	No idea	31 (21.2)	14 (26.4)	04 (21.1)	02 (5.6)	
Do you think that the cost of dental materials/equipments and orthodontic treatment is going to increase post-COVID?	Yes	130 (89)	43 (81.1)	17 (89.5)	33 (91.7)	0.018*
	No	02 (1.4)	06 (11.4)	02 (10.5)	03 (8.3)	
	No idea	14 (9.6)	04 (7.5)	0	0	
According to you, who will bear the additional cost of extra safety protocols?	Patient	23 (15.8)	21 (39.6)	10 (52.6)	07 (19.4)	0.001**
	Orthodontist	27 (18.5)	05 (9.4)	0	05 (13.9)	
	50% Patient + 50% Orthodontist	94 (64.4)	27 (50.3)	08 (42.1)	21 (58.3)	
	Others	02 (1.4)	0	01 (5.3)	03 (8.3)	
Is your staff willing to work in such conditions?	Yes	37 (25.1)	25 (47.2)	08 (42.1)	19 (52.8)	0.004*
	No	43 (29.5)	17 (32.1)	03 (15.8)	07 (19.4)	
	May be	66 (45.2)	11 (20.8)	08 (42.1)	10 (27.8)	
Which treatment modality is preferable in post-COVID era?	Fixed orthodontic treatment	35 (24.0)	10 (18.9)	04 (21.1)	08 (22.2)	0.178
	Functional/Orthopaedic appliances	02 (1.4)	01 (1.9)	0	01 (2.8)	
	Removable orthodontic appliances	04 (2.7)	0	02 (10.5)	0	
	Clear aligners	70 (47.9)	22 (41.5)	07 (36.8)	11 (30.6)	
	Combination	35 (24.0)	20 (37.7)	06 (31.6)	16 (44.4)	
In your opinion, what could be the future of orthodontics in developing countries like India in the post-COVID era?	Less demand of orthodontic treatment	24 (16.4)	12 (22.6)	03 (15.8)	08 (22.2)	0.002*
	Same as before the COVID-19 pandemic outbreak	21 (14.4)	10 (18.9)	03 (15.8)	11 (30.6)	
	Increased digitalisation in orthodontics	71 (48.6)	20 (37.7)	11 (57.9)	14 (38.9)	
	Can't say	26 (17.8)	02 (3.8)	02 (10.5)	01 (2.8)	
	Option 1 and 3	04 (2.7)	09 (17.0)	0	02 (5.6)	

[Table/Fig-4]: Comparison of responses of study subjects based on years of experience.
(p<0.05*statistically significant; p<0.001**statistically highly significant)

q4[a]	B	Std. Error	Wald	df	Sig.	Exp (B)	95% Confidence interval for Exp (B)	
							Lower bound	Upper bound
Intercept	-3.999	0.755	28.070	1	0.000			
Educational qualification	2.195	0.746	8.660	1	0.003	8.976	2.081	38.710
Designation	-0.761	0.490	2.414	1	0.120	0.467	0.179	1.220
Years of experience	0.208	0.192	1.172	1	0.279	1.231	0.845	1.795
Intercept	-1.688	0.518	10.612	1	0.001			
Educational qualification	0.565	0.670	0.710	1	0.400	1.759	0.473	6.547
Designation	-0.243	0.443	0.300	1	0.584	0.784	0.329	1.870
Years of experience	0.154	0.173	0.791	1	0.374	1.166	0.831	1.637

[Table/Fig-5]: Binominal and Multinominal logistic regression analysis at 95% Confidence Intervals. The first set of coefficients represents comparison between those not likely to resume practice (Responded No, coded 2) and those likely to resume practice (Responded yes, coded 1).
B: Unstandardised beta regression coefficient; Std. Error: Standard error; df: Degrees of freedom; Sig.: Significance

causing COVID-19 infection, so the prevention protocol should be religiously followed in dental practice and daily life [24]. Dental professionals should play a major role in preventing the transmission of coronavirus. When the routine dental care was suspended during the period of COVID-19 pandemic, there was a need for organised urgent care delivery system fully equipped with adequate PPEs [25].

In the present survey, all groups (based on designation, educational classification or clinical experience) agreed that aesthetics was the most important concern among patients for seeking orthodontic treatment. This is in agreement to survey findings of Wędrychowska-Szulc B and Syrynska M, published in 2010 concluding that "Improvement in dental aesthetics was the principle motivational factor for the children, their parents/guardians, and adult patients seeking orthodontic treatment" [26].

When comparing the response on willingness of staff to work between different groups, a significant difference was found ($p<0.01$) in the present survey. Private practitioners, consultants and academicians were almost 2.5 times more affirmative than the postgraduates ($p<0.01$). Also, the orthodontists with more than 15 years of experience were more than twice affirmative than having less than 5-years experience ($p<0.01$). This clearly indicates that experience instills more confidence in the staff towards the clinical practice. Kerr J, concluded that experienced physicians can become better with the balance of confidence and humility which can benefit co-workers as well as patients [27].

Caprioglio A et al., classified orthodontic emergencies and proposed various guidelines for the management of those emergencies using visual assistance aids [28]. ADA has also issued interim guidance for management of emergency and urgent dental care [29]. The Guidelines for Dental Professionals in COVID-19 pandemic situation issued on 19 May 2020 specify the standard protocols to be followed in different risk care settings–low, medium and high risk [30]. CDC has reorganised guidelines for dental settings for routine dental healthcare delivery during the pandemic and providing dental healthcare to a suspected or confirmed SARS-CoV-2 infected patient [31].

There was wide variation in the selection of the safety protocols by the orthodontists in the present study ($p<0.01$). The reason may be different financial conditions, set-ups in different localities or unawareness. Some respondents, although a very little percentage, were satisfied with very basic surgical masks and gloves. Selcen F and Kilinc J stated reasons why Health Care Workers (HCWs) chose not to wear PPE including lack of proper training, limited material availability, increased working time, decrease in performing ability and many others [32]. Srirengalakshmi M et al., in their article highlighted the dichotomy of attitudes and responses among orthodontic professionals in accepting the "new normal" and provided guidance on precautions to be taken, preappointment screening and triage, disinfection and sterilisation protocols and aerosol mitigation during treatment of orthodontic patients in the COVID-19 era [33].

A 70.1% of the participants were of the opinion that basic qualities like high GSM, SITRA approval, impermeable to blood and body fluids, meeting or exceeding ISO 16603 class 3 exposure press or equivalent should be checked while buying PPEs/autoclavable coveralls. In this question also, the results were significantly different among different groups based on designation or educational qualification ($p<0.01$) but not on clinical experience.

N95 face masks are regulated by the National Institute for Occupational Safety and Health (NIOSH) and the CDC. An N-95 respirator mask is mandatory for dental professionals, is a well-known fact and CDC has recommended five mask reuse protocol for 20 working days [34]. But still there was a lot of confusion about its reusability. Only 58.7% of the reported orthodontists had given an affirmative answer to this question with some of them giving explanations like 'use it once, keep away for three days then use again for a day, it may be sterilised etc.

Academicians and private practitioners are significantly more sure that N95 masks can be reused than postgraduates pursuing MDS in orthodontics ($p<0.01$). N95 masks provide protection from small airborne particles, including aerosols after fit-testing to ensure a tight seal around the user's face. There are strict regulations dictating the filtration efficiency and breathing resistance of N95 respirators [35].

The survey reported that 40.2% avoided using air rotor, ultrasonic scaler and 3-way syringe, 9.1% preferred the use of micromotor and hand scaler with irrigation with syringe and another 4.7% advocated the use of handpiece with anti-retraction valves with extraoral high volume suction. Just 24.4% responded for HEPA filter along with use of handpiece with anti-retraction valves with extraoral high volume suction and remaining 21.7% responded to perform aerosol generating procedures in isolation negative pressure operatory/Airborne Infection Isolation Rooms (AIIRs) ($p<0.01$). Fear factor may be a cause for highly significant difference in responses. Strategies including patient evaluation, hand hygiene, personal protective measures for the dental professionals, mouthrinse before dental procedures, rubber dam isolation, anti-retraction handpiece, disinfection of the clinic settings, and management of medical waste are a must to prevent the transmission of 2019-nCov during dental diagnosis and treatment [36,37].

Biomedical Waste Management (BMW) was considered difficult by 68.9%; 20.1% had no idea about it and some stating it 'meticulous; similar; manageable etc'. Academicians were found to be significantly more confident about BMW ($p<0.05$). In addition to BMW management rules 2016, specified guidelines for the management of waste generated during diagnostics and treatment of COVID-19 suspected/confirmed patients should be followed in isolation wards, quarantine centres, sample collection centres, laboratories and common biomedical waste treatment and disposal facilities [38].

With regard to future of orthodontic practice in post-COVID 19, 87% thought that the cost of dental materials/equipments and orthodontic treatment would increase post-COVID with results significantly different among groups based on clinical experience ($p<0.01$). The

present and the upcoming challenge in the post-COVID-19 era would be an increase in the cost of oral health services limiting the patient access to health care especially in developing countries like India [39,40]. Only 14.6% said that the orthodontists should bear the additional cost; 24% objected that it should be paid by the patient. A 59.1% agreed that cost be divided equally among the patient and the orthodontist while the remaining 2.4% gave additional options like 'the institution which I am working with; depends on work place; govt/third party like insurance company etc.,' ($p<0.01$).

The most common modality selected overall as well as by all groups in all categories was clear aligners (43.3%). The use of aligners as treatment modality in orthodontic offices can bring about efficient tooth movement with more spaced out appointments, reduced chair-side time, minimum intraoral treatments and almost negligible aerosol generation during the treatment [41]. Naseem KT et al., and Sharan J et al., in their review focused on the publications on changes in orthodontic practice due to COVID-19 pandemic, handling of orthodontic emergencies during lockdown and valuable preventive measures for orthodontic professionals [42,43].

Although, it was difficult to predict the future of orthodontics in those circumstances, but together it might become a reality. The present survey reported that increased digitalisation in orthodontics (45.7%) had the highest probability followed by less demand of orthodontic treatment (18.5%). Experienced orthodontists were optimistic that future of orthodontics in the post-COVID era will be same as before the outbreak of this pandemic with increased digitalisation ($p<0.01$).

Digitalisation (individualised) orthodontics is the key option to have minimum physical contact with the patient, clear aligners/appliances printed digitally with devices like accledent or biopharmacologic agents (Precision orthodontics) to enhance the orthodontic tooth movement to complete the orthodontic treatment as early as possible [44-46].

Limitation(s)

The participants were anonymous and had different levels of knowledge, different clinical experiences, set-ups in different localities and from different places/backgrounds, so the difference in opinions. Further such studies should be conducted with larger sample sizes.

CONCLUSION(S)

The present survey found that the orthodontic community as a whole had been affected greatly by the COVID-19 pandemic and was quite apprehensive. The study suggested the need and importance of a training program for dental settings during COVID-19 imparting adequate knowledge about basic sterilisation protocols, basic requirements of PPEs, the donning and doffing methods, reusability of N95 masks and BMW for the patient's and the clinician's safety. So, the entire orthodontic fraternity got together in these difficult times to ensure a better future and pulled out the anxieties by discussion and tried to find out the possible solutions. Webinars and online panel discussions conducted during current lockdowns were great endeavours.

That the future of orthodontics in the post-COVID era is unpredictable presently, it won't be the same as it was before the lockdown. Dental procedure cost which is already considered high by many will rise even higher due to use of new PPEs for every patient and every appointment. The overall opinions in the survey might also aid in policy-making for the orthodontists in the future.

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[Annexure 1] - Survey Questionnaire

Survey: Orthodontic Practice in the Times of Corona

The massive impact of COVID-19 pandemic is evident in all aspects of life-personal, social as well as professional.

The Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dental Sciences, SGT University, Gurugram (Haryana) is conducting this survey with the objective to assess the basic sterilisation protocols that needs to be followed in orthodontic practice during the COVID-19 pandemic and to predict the future of orthodontics in the post-COVID era.

Requesting all the orthodontists to answer these 15 questions and help us in formulating a thorough study and a valid outcome that might aid in policy-making for the orthodontists in the future.

(Participation in this survey is completely anonymous and voluntary.

If you have any suggestions or queries, send them at dr.suman.summi@gmail.com.)

* Required

Q 1. I am working in/as a *
- Private clinic
- Consultancy
- Academician
- Government hospital/college
- PG Student

Q 2. Clinical experience *
- <5 years
- 5-10 years
- 10-15 years
- 15 years

Q 3. Has COVID-19 affected your orthodontic practice? *
- Yes
- No

Q 4. Do you feel it is safe to resume your orthodontic practice in the current situation? *
- Yes
- No
- Can't say

Q 5. In your practice, most of the patients require orthodontic treatment primarily for *
- Aesthetics
- Functional problems
- Growth modification
- Other:

Q 6. What all safety protocols will you follow/are following in your orthodontic set up?*
- PPEs (Disposable), N95 masks, eye glass protectors
- PPEs (Disposable), N95 masks, Face shield
- PPEs (Disposable) with hood and shoe covers, N95 masks, eye glass protectors
- Autoclavable surgical coveralls, head caps, shoe covers, surgical masks, Face shields
- PPEs (Disposable) with hood and shoe covers, N95 masks, Face shields
- Other:

Q 7. Which basic qualities one should check while buying PPEs/ autoclavable coveralls?*
- High GSM, SITRA approval
- High GSM, non-woven, laminated, taped, water proof
- Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class three exposure press or equivalent
- High GSM, SITRA approval, Impermeable to blood and body fluids, Meets or exceeds ISO 16603 class 3 exposure press or equivalent
- Other:

Q 8. Can N95 mask be reused?*
- Yes
- No
- Don't know
- Other:

Q 9. What basic precautions/measures will you take/are taking to prevent aerosol generation in your orthodontic practice? *

- Just Avoid using air rotor, ultrasonic scaler and 3-way syringe
- Use of micromotor and hand scaler with irrigation with syringe
- Use of handpiece with anti-retraction valves with Extraoral high volume suction
- HEPA filter along with Use of handpiece with anti-retraction valves with Extraoral high volume suction
- Aerosol generating procedures done in Isolation negative pressure operatory/Airborne Infection Isolation Rooms (AIIRs)
- Other:

Q 10. Managing Biomedical Waste Management (BMW) of PPEs will be? *

- Easy
- Difficult
- No idea
- Other:

Q 11. Do you think that the cost of dental materials/equipments and orthodontic treatment is going to increase post-COVID?*

- Yes
- No
- No idea
- Other:

Q 12. According to you, who will bear the additional cost of extra safety protocols?*

- Patient
- Orthodontist
- 50% Patient + 50% Orthodontist
- Other:

Q 13. Is your staff willing to work in such conditions?*

- Yes
- No
- Maybe
- Other:

Q 14. Which treatment modality is preferable in post-COVID era?*

- Fixed orthodontic treatment
- Functional/Orthopedic appliances
- Removable orthodontic appliances
- Clear aligners
- Other:

Q 15. In your opinion, what could be the future of orthodontics in developing countries like India in the post-COVID era?*

- Less demand of orthodontic treatment
- Same as before the COVID-19 pandemic outbreak
- Increased digitalisation in orthodontics
- Can't say
- Other: