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Research Article

Assessment of Knowledge, Attitude and Practice of Digital Orthodontics Among Orthodontists and Orthodontic Residents in Gujarat: A Questionnaire Study

Narayan B. Kulakrni¹ and Shrishtee Goyal^{2*}¹Professor and PG Guide, KM Shah Dental College and Hospital, Sumandeep Vidyapeeth, Vadodara, Gujarat, India²3rd Year Post-Graduate Student, KM Shah Dental College and Hospital, Sumandeep Vidyapeeth, Vadodara, Gujarat, India

ARTICLE INFO

Article history:

Received: 27 May, 2022

Accepted: 7 June, 2022

Published: 24 June, 2022

Keywords:

Digital orthodontics

Gujarat

orthodontic residents

orthodontists

questionnaire

ABSTRACT

Introduction: Introduction of digital technology in orthodontics has improved the overall experience for the patient as well as the clinician. This study aimed to assess knowledge, attitude and practice of digital orthodontics among orthodontists and orthodontic residents in Gujarat through a questionnaire.

Materials and Methods: The questionnaire comprised of two parts, the first part which consisted of sociodemographic details (5 questions) and the second part consisted of questions to assess the knowledge (2 questions), attitude (9 questions) and practice (3 questions) of digital orthodontics. The final developed questionnaire after content validity was sent to Orthodontists and Orthodontic residents as Google Form link to Gujarat Orthodontic Study Group over WhatsApp and the received responses were recorded.

Results: Kolmogorov-Smirnov test was employed to test the normality of data. Chi Square test was performed for the quantitative variables. Results showed that majority of the participants knew about availability of digital orthodontics. Revealed a positive incline in incorporating digital orthodontics in their routine practice. However, a lack was observed in practicing digital orthodontics among Orthodontists and Orthodontic Residents of Gujarat. Statistically significant difference was present regarding the awareness about digital orthodontics between males and females (p value = 0.042).

Conclusion: Orthodontists and orthodontic residents of Gujarat displayed adequate knowledge, positive attitude and lack of practice about digital orthodontics. Male population is more aware about digital technologies as compared to female population.

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Introduction

Digital technology aids in diagnosis and treatment planning; laboratory and clinical procedures which aids the clinician to achieve a precise treatment outcome to an advanced level. Introduction of digital technology in orthodontics has improved the overall experience and predictability of the treatment for the patient as well as the clinician.

The age of digitalization and innovation has hit the health care sector like a lightning bolt. Especially the process of dealing with the corona crisis has shown the need for digital communication, digital networking, telemedicine, and more. The influence of digitalization in health care is stronger than ever. Dentistry is already undergoing a digitalization process. The digital workflow starts with paperless clinics. Orthodontic

treatment is also digitalized, and information for dental lab technicians can be transferred digitally too. Radiology and imaging services in a dental practice are usually digital, so there is no need to search for X-rays in filing cabinets, and the pictures are available quickly and easily on the servers [1].

Various technologies like digital photography (DP) (Conon, Nikon, Sony, etc.), Digital Radiography (DR) like CBCT and OPG (PreXion3D, Planmeca, Vatech, Dentsply, Carestream CS 9300, Kodak, etc.), facial 3D scans (Artec 3D, Shining, Creaform, etc.), 3D Photography (Ortery, PhotoRobot, Snap 36, etc.), Intra-oral scanning (IOS) or Digital Impressions (DI) (3Disc Imaging, 3shape, Align Technology, Carestream Dental, Condor, Dental Wings, iTero, Denterprise, Dentsply Sirona, Imetric 4D Imaging GmbH, Intelliscan, Medit, NewTom,

*Correspondence to: Dr. Shrishtee Goyal, B.D.S., 3rd Year Post-Graduate Student, KM Shah Dental College and Hospital, Sumandeep Vidyapeeth, Vadodara, Gujarat 391760, India; Tel: +919893985437; E-mail: shrishtee@gmail.com

Planmeca, Runyes Medical Instrument Co., Ltd., Shining 3D, Video Dental Concepts, Zimmer Dental, etc.), digital study models (DSM), Clear Aligners (CA) (Invisalign, Flash, Illusion, etc.), rapid prototyping (RP) (Stereolithography (SLA) or Vat Photopolymerization, Selective Laser Sintering (SLS), Fused Deposition Modelling (FDM) or Material Jetting, Selective Laser Melting (SLM) or Powder Bed Fusion, Laminated Object Manufacturing (LOM) or Sheet Lamination, etc.), 3D Printing (3D Systems, AddUp, Arcam, Concept Laser, DMG Mori, EOS, etc.), digital cephalometric analysis (DCA) (Dolphin, NemoCeph, Proceph, Ceph Ninja, Facad, etc.), robotic wire bending (MOTOMAN UP6, LAMDA system, Cartesian type archwire bending robot, Suresmile, etc.), finite element modelling (FEM) (MFEM, COMSOL Multiphysics, SDC Verifier, deal.II, Abaqus CalculiX, etc.), digital surgical planning (DSP), virtual bracket placement/removal (VBPR), etc. have helped orthodontists diagnose facial deformities, skeletal discrepancies, impacted teeth, etc. provided a virtual space for planning to aid in comprehensive clinical execution for getting a precise treatment outcome [2-5].

After a thorough review, there was no study found that assessed the knowledge, attitude and practice of digital orthodontics among orthodontists and orthodontic residents in Gujarat. Hence, this study was planned. The objectives of this study was to develop a questionnaire tool which evaluated knowledge, attitude and practice of digital orthodontics among orthodontist and orthodontic residents in Gujarat.

Materials and Methods

A cross-sectional survey was conducted with a pretested questionnaire comprising of 19 questions to assess sociodemographic characteristics (05), knowledge (02), attitudes (09), practice (03 questions) among the

orthodontists and orthodontic residents of Gujarat, India. A structured online questionnaire along with informed consent was prepared, which was sent through social media platforms with the help of google form.

The study population comprised of 360 members, 220 orthodontists and 140 orthodontic residents of Gujarat, India. The Sample size was estimated using G* power software (Version 3.1) by keeping the alpha error probability as 0.05, with an effect size of 0.3 and power 0.95 which accounted for 220. All the practicing orthodontists and orthodontic residents from Gujarat Orthodontic Study Group willing to participate in the study were included. Orthodontists and orthodontic residents who had no registered mail, id and not willing to provide informed consent were excluded. A total of 360 orthodontists and orthodontic residents in Gujarat Orthodontic Study Group were contacted out of which 307 members participated in this study. The study was started after obtaining the ethical approval.

A questionnaire was designed in accordance with the identified domains using relevant literature as well as upon the opinions based on the professional expertise of the authors. The questionnaire validity was carried out by evaluating the content and face validity by the subject experts (07 experts). The subject experts were asked to rate the questions on a 4-point ordinal scale (1: not relevant), (2: somewhat relevant), (3: quite relevant) and (4: highly relevant) [6]. The quantitative assessment of validation was done using the content validity ratio (S-CVI) obtained by dividing number of experts who scored the item 3 and 4 by the total number of experts. (Table 1). An average score of 95% was obtained suggesting minor changes to be done in the questionnaire. The minor corrections in the questionnaire were done according to the suggestions of the subject experts and then subjected to the online survey (Annexure 1).

Table 1: Scale-content validity index.

Score	1	2	3	4	1	2	3	4	S-CVI
Questions					%				
1. Name	0	0	0	7	0	0	0	100	1
2. Email	0	0	0	7	0	0	0	100	1
3. Gender	0	0	0	7	0	0	0	100	1
4. Year of Post-Graduation	0	3	4	0	0	42.85	57.14	0	0.57
5. Clinical Experience	0	2	5	0	0	28.57	71.43	0	0.71
6. Type of Practice	0	2	4	1	0	28.57	57.14	14.28	0.71
7. Are you aware of Digital Orthodontics?	0	0	0	7	0	0	0	100	1
8. There are several digital tools and platforms that aid in enhancing the orthodontic treatment, accuracy and efficiency. Which of these are you aware of? (multiple answers)	0	0	0	7	0	0	0	100	1
9. Which of these digital platforms are you currently utilizing? Name them. (multiple answers)	0	0	0	7	0	0	0	100	1
10. What method do you practice for making impression of patients?	0	0	0	7	0	0	0	100	1
11. Which method of making impression gives more convenience as per operator and patient perspective according to you?	0	0	0	7	0	0	0	100	1
12. In the COVID-19 pandemic, which method of impression taking will be a better option according to you?	0	0	0	7	0	0	0	100	1
13. What method of radiographic analysis do you practice?	0	0	0	7	0	0	0	100	1
14. Do you use 3D soft tissue prediction softwares for orthognathic surgeries?	0	0	0	7	0	0	0	100	1
15. Do you think that with usage of digitally customized bracket systems and wires along with virtual diagnosis and treatment planning, total	0	0	0	7	0	0	0	100	1

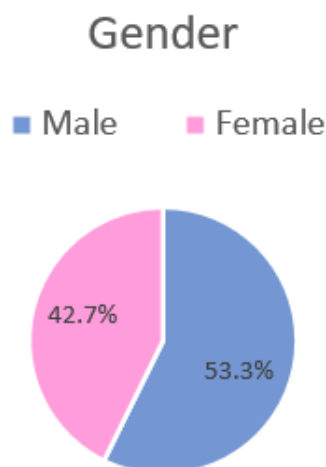
orthodontic treatment time will decrease compared to the conventional methods?									
16. Will you be investing in digital and customized orthodontic systems in the future?	0	0	0	7	0	0	0	100	1
17. Which digital technologies used in orthodontics would you like to invest in? (Multiple answers)	0	0	0	7	0	0	0	100	1
18. Is the increased cost of these digital technologies deterring you from using them in your routine practice?	0	0	0	7	0	0	0	100	1
19. Are you concerned about the availability of 3D printers and digital tools in today's world starting a trend for companies to directly deliver aligners and orthodontic appliances to patient at doorstep?	0	0	0	7	0	0	0	100	1
20. Do you think digital orthodontics will have a significant role in the field of orthodontics in future?	0	0	0	7	0	0	0	100	1

The study was conducted in the month of November 2021. The responses of the questionnaire was accepted till 20 days of period. The reminder mail was sent to a maximum of 3 times with an interval of 5 days to all the participants. According to the answers given by Orthodontist and Orthodontic Residents responses were recorded. Respondents could submit their answers only after answering all the questions. The questionnaire could be accessed through email account only once. The respondents could not change their answers after submission.

The data was assembled, organized and entered in Microsoft Excel and subjected to statistical analysis using Statistical Package for Social Sciences (SPSS, IBM version 20.0). The level of significance was fixed at 5% and $p \leq 0.05$ was considered statistically significant. Kolmogorov-Smirnov test was employed to test the normality of data. Chi Square test was performed for the quantitative variables.

Results and Observations

The present study was carried out to assess the knowledge, attitude and practice of digital orthodontics among orthodontists and orthodontic residents in Gujarat. The results are based on questionnaire based analysis of 307 samples assessing the knowledge, attitude and practice of digital orthodontics.



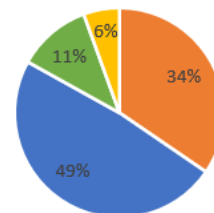
Graph 1: Gender Distribution.

Graph 1 shows that a majority of the participants were males (53.3%). Graph 2 shows that a majority of participants had a clinical experience

between 4 to 10 years (49%). Graph 3 shows that the majority of participants were practicing at a private clinic (31%).

Clinical Experience

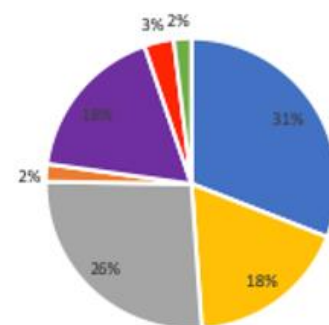
■ 1-3 Years ■ 4-10 Years ■ 11-20 Years ■ >20 Years



Graph 2: Clinical Experience.

Type of Practice

■ Private Clinic ■ Consultancy
 ■ Academic ■ Private Clinic and Consultancy
 ■ Private Clinic and Academic ■ Consultancy and Academic
 ■ Private Clinic, Consultancy and Academic



Graph 3: Type of Practice.

Table 2 shows the evaluation of knowledge, attitude and practice of digital orthodontics among study participants. All the participants were aware of digital orthodontics and were willing to invest in digital and customized orthodontic systems in the future. Majority of the participants in our study were utilizing DP and radiography (44%). For making impressions of patients a major proportion of the participants were practicing conventional technique (47.6%). Participants felt that in Covid 19 pandemic, DI (88.6%) making will be a better opinion when

compared with the conventional one. Majority of the participants were not using 3D soft tissue prediction software and felt that increased cost of digital technologies is deterring them from using. All the participants

felt that digital orthodontics will have a significant role in the field of orthodontics in future.

Table 2: Evaluation of knowledge, attitude and practice of digital orthodontics among study participants.

Question	Options	N (%)
Are you aware of digital orthodontics	Yes	307 (100.0)
	No	-
There are several digital tools and platforms that aid in enhancing the orthodontic treatment, accuracy and efficiency. Which of these are you aware of?	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, CA, 3D printing in Orthodontics	50 (16.3)
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, CA, 3D printing in Orthodontics, RP	12 (3.9)
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, FEM, CA, 3D printing in Orthodontics	62 (20.2)
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, FEM, CA, 3D printing in Orthodontics, RP	99 (32.2)
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, Digital fabrication of appliances and retainers, CA, 3D printing in Orthodontics, RP	71 (23.1)
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, Digital fabrication of appliances and retainers, FEM, CA, 3D printing in Orthodontics	13 (4.2)
Which of these digital platforms are you currently utilizing? Name them.	DP, DR	135 (44)
	DP, DR, DI	61 (19.9)
	DP, DR, DI, DCA, CA	61 (19.9)
	DP, DR, DI, DCA, CA, surgical planning	50 (16.3)
What method do you practice for making impressions of patients?	Conventional	146 (47.6)
	Digital	24 (7.8)
	Both	137 (44.6)
Which method of making impression gives more convenience as per operator and patient perspective according to you?	Conventional	49 (16)
	Digital	220 (71.7)
	Both give same results	38 (12.4)
In the COVID-19 pandemic, which method of impression making will be a better option according to you?	Conventional	11 (3.6)
	Digital	272 (88.6)
	Either of the above	24 (7.8)
What method of radiographic analysis do you practice?	Manual	36 (11.7)
	Digital technique (e.g., NemoCeph, Dolphin, etc.)	61 (19.9)
	Both	210 (68.4)
Do you use 3D soft tissue prediction softwares for orthognathic surgeries?	Yes	172 (56)
	No	135 (44)
Do you think that with usage of digitally customized bracket systems and wires along with virtual diagnosis and treatment planning, total orthodontic treatment time will decrease compared to the conventional methods?	Yes	199 (64.8)
	No	48 (15.6)
	Maybe	60 (19.5)
Will you be investing in digital and customized orthodontic systems in the future?	Yes	307 (100)
	No	-
Which digital technologies used in orthodontics would you like to invest in?	CA	122 (39.6)
	CA, DI, Intraoral Scanners:	56 (18.2)
	CA, DI, Intraoral Scanners, DCA:	28 (9.1)
	3D Printing, Digitally Fabricated Appliances	28 (9.1)
	Intra-Oral Scanner, 3D Printing	37 (12)

	CA, DI, Intraoral Scanners, 3D Printing, Digitally Fabricated Appliances, DCA	37 (12)
Is the increased cost of these digital technologies deterring you from using them in your routine practice?	Yes	282 (91.9)
	No	25 (8.1)
Are you concerned about the availability of 3D printers and digital tools in today's world starting a trend for companies to directly deliver aligners and orthodontic appliances to patient at doorstep?	Yes	232 (75.6)
	No	12 (3.9)
	Maybe	63 (20.5)
Do you think digital orthodontics will have a significant role in the field of orthodontics in future?	Yes	307 (100)
	No	
	Maybe	

Table 3 shows the gender and clinical experience wise comparison of knowledge, attitude and practice of digital orthodontics among study participants. A gender wise evaluation revealed significant difference regarding awareness of digital tools (p value .042) among the males and

females. No significant difference was seen among regarding the knowledge, attitude and practice of digital orthodontics with respect to the clinical experience of the orthodontists.

Table 3: Evaluation of knowledge, attitude and practice of digital orthodontics among study participants according to gender and clinical experience.

Question	Options	Male N	Female N	p value	1-3 years	4-10 years	11-20 years	More than 20 years	p value
Are you aware of digital orthodontics	Yes	171	136	-	106	149	35	17	
	No	-	-						
There are several digital tools and platforms that aid in enhancing the orthodontic treatment, accuracy and efficiency. Which of these are you aware of?	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, CA, 3D printing in Orthodontics	36	14	0.042*	14	27	5	4	0.863
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, CA, 3D printing in Orthodontics, RP	10	2		5	6	1	0	
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, FEM, CA, 3D printing in Orthodontics	37	25		26	27	7	2	
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, VBPR, Digital fabrication of appliances and retainers, FEM, CA, 3D printing in Orthodontics, RP	48	51		29	50	13	7	
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, Digital fabrication of appliances and retainers, CA, 3D printing in Orthodontics, RP	38	33		25	35	7	4	
	DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, Digital fabrication of appliances and retainers, FEM, CA, 3D printing in Orthodontics	7	6		4	6	7	2	
Which of these digital platforms are you currently utilizing? Name them.	DP, DR	74	61	0.68	44	69	13	9	0.713
	DP, DR, DI	34	27		18	32	9	2	
	DP, DR, DI, DCA, CA	39	22		22	30	6	3	

	DP, DR, DI, DCA, CA, surgical planning	29	21		22	18	7	3	
What method do you practice for making impressions of patients?	Conventional	84	62	0.845	52	70	18	6	0.321
	Digital	15	9		6	12	2	4	
	Both	77	60		48	67	15	7	
Which method of making impression gives more convenience as per operator and patient perspective according to you?	Conventional	23	26	0.184	15	23	7	4	0.191
	Digital	133	87		71	112	24	13	
	Both give same results	20	18		20	14	4	0	
In the COVID-19 pandemic, which method of impression making will be a better option according to you?	Conventional	7	4	0.256	2	8	1	0	0.653
	Digital	159	113		97	127	32	16	
	Either of the above	10	14		7	14	2	1	
What method of radiographic analysis do you practice?	Manual	23	13	0.629	12	19	2	3	0.406
	Digital technique (e.g., NemoCeph, Dolphin, etc.)	36	25		16	30	10	5	
	Both	117	93		78	100	23	9	
Do you use 3D soft tissue prediction softwares for orthognathic surgeries?	Yes	100	72	0.746	57	87	17	11	0.601
	No	76	59		49	62	18	6	
Do you think that with usage of digitally customized bracket systems and wires along with virtual diagnosis and treatment planning, total orthodontic treatment time will decrease compared to the conventional methods?	Yes	115	84	0.742	67	100	20	12	0.834
	No	29	19		17	23	7	1	
	Maybe	32	28		22	26	8	4	
Will you be investing in digital and customized orthodontic systems in the future?	Yes	176	131	-	106	149	35	17	
	No	-							
Which digital technologies used in orthodontics would you like to invest in?	CA	66	55	0.437	43	53	15	10	0.339
	CA, DI, intraoral scanners:	30	26		18	32	6	0	
	CA, DI, intraoral scanners, DCA:	15	13		7	15	4	2	
	3D printing, digitally fabricated appliances:	19	9		10	10	5	3	
	Intra-oral scanner, 3D printing	20	17		14	17	4	2	
	CA, DI, intraoral scanners, 3D printing, digitally fabricated appliances, DCA	26	11		14	22	1	0	
Is the increased cost of these digital technologies deterring you from using them in your routine practice?	Yes	163	119	0.574	97	136	33	16	0.924
	No	13	12		9	13	2	1	
Are you concerned about the availability of 3D printers and digital tools in today's world starting a trend for companies to directly deliver aligners	Yes	131	101	0.858	80	107	29	16	0.495
	No	7	5		4	7	1	0	
	Maybe	38	25		22	35	5	1	

and orthodontic appliances to patient at doorstep?									
Do you think digital orthodontics will have a significant role in the field of orthodontics in future?	Yes	176	131	-	106	149	35	17	-
	No								
	Maybe								-

Discussion

Awareness among the patient's encountering pathogens transmitted through blood or other body fluids has led to stringent protocol for sterilization and disinfection in clinical practice with limited chair side time especially during the COVID-19 pandemic [7, 8]. Digitalization in the field of dentistry is helpful in reducing the spread of these infections by providing a virtual room to reduce the time required for diagnosis and treatment. Living in a generation where digital technology is increasing exponentially, making processes easier, less time consuming and laborious, dentists are not far from catching up. Dental practitioners have started using most of the digital technology available, but a majority of the population is still unaware of the various tools available that can make their professional life easier. Orthodontists are amongst dental professionals who require most of the technological tools available in the field of dentistry. This study assessed the knowledge, attitude and practice of digital orthodontics among orthodontists and orthodontic residents in Gujarat through a questionnaire.

The objective of the study required accessibility to a large population, even the ones we don't know personally; in a short amount of time and at the same time, it should be economical and should not require any special equipment or skills. Hence a questionnaire study was planned [9]. The Questionnaire survey also helped us in gaining knowledge about perspectives of orthodontist and orthodontic residents from every corner of Gujarat. The questionnaire was first subjected to content and construct validity using the CVI. If the S-CVI for individual question was higher than 79 percent, the question was considered appropriate. If it was between 70 to 79 percent, a need of revision was considered. If it was less than 70 percent, the question was eliminated [10]. 17 out of 20 items showed 100% validity, 2 items showed 71% validity and changes were made in those questions accordingly and only 1 item showed 57% validity which was then removed from the questionnaire. Suggestions made by the experts were to combine question numbers 4 and 5 and make a provision for question number 6 to choose multiple option answers. The questionnaire was sent after making the necessary changes.

Majority of respondents in this study were males (57.3%) (Graph 1), a larger part of the sample had a clinical experience of 4 to 10 years (48.5%) (Graph 2), and most of the people who responded to this questionnaire were private practitioners (Graph 3) who were aware of digital orthodontics. All of the respondents knew about DP, DI, DSM, DR (CBCT, OPG, etc.), DCA, DSP, digital fabrication of appliances and retainers, CA, 3D printing in orthodontics. A few participants were not aware of certain technologies including FEM (43.3%), RP (40.7%), and VBPR (27.2%). Most of the respondents preferred only DP and DR in their routine dental practice (44%), additionally a very few have preferred to use DI (19.9%), DCA and CA (19.9%), and DSP in routine practice (16.3%). These results were similar to observations made by Pradeep Philip George *et al.* who also concluded that orthodontists in

Kerala were aware of tele-dentistry and its use, but were not willing to practice, it routinely [11].

Maximum respondents preferred both, conventional and DI making techniques (44.6%) and 71.7% of respondents felt that DI making technique was more convenient for both the clinician and patient. However, the impact of COVID-19 pandemic was pragmatic, 88.6% of the participants responded that DI making was a better option. A study by Schott *et al.* concluded that dental students were able to practice both, conventional and DI with ease without any prior training for the same [12]. A maximum number of participants preferred both manual and digital methods of cephalometric analysis (68.4%). 56% of participants preferred 3D soft tissue prediction software for planning orthognathic surgeries.

A majority of the sample (64.8%) believed that treatment duration of orthodontic treatment decreases with the usage of digitally customized bracket systems and wires along with virtual diagnosis and treatment planning. This was contradictory to the results of a study by Margarita Papakostopoulou and Dominic Hurst who concluded that the customized orthodontic system was not associated with significantly reduced treatment duration, and treatment quality was comparable between the 2 systems, however, it has a significant effect in decreasing the clinical time and improving patients' experiences [13].

All of the orthodontists and orthodontic residents responded positively regarding investment in digital technologies used in orthodontics and almost all of them had a wish to invest in CA. Additionally, very few had inclination towards investing in other technologies like intra oral scanners, DI, 3D printing and Digitally Fabricated Appliances. The probable reason for orthodontists wanting to invest in these digital technologies can be attributed to the marketing through social media, conferences, etc. and the urge of clinician to upgrade his clinical setup to be at par with his contemporaries.

Both orthodontists and orthodontic residents agreed that digital technology plays a significant role in the present and future of orthodontics, but most of the participants (91.9%) are not able to use the newer technologies in routine practice due to their high cost. A study by Ahmed *et al.* pointed out this limitation of high investment cost at an early stage [14]. Even though the returns for the same will be high if properly and adequately implemented in clinical practice, clinicians are hesitant about investing a huge amount of money into digital technologies. Hence development of specific marketing centers can facilitate and endorse adequate implementation of these technologies in routine clinical practice. Dental 3d printing, RP, finite element and intra oral scanning equipment's needs to be upgraded in commercial dental laboratories or establishment of specific commercial centers is the new arena in the dentistry.

75.6% of the participants were concerned about companies delivering aligners directly to patient, hence eliminating their role in the orthodontic treatment process. Do-It-Yourself Aligners or Direct-to-Consumer Orthodontics provide an easy, convenient and economical means to align teeth without visiting an orthodontist [15-17]. However, all of these also suggest the patients to consult an orthodontist as these at-home aligners can cause deleterious effects like root resorption, poor occlusal contacts, etc. as well. The National Dental Council in consultation with the orthodontic council needs to tackle this problem for the benefit of the patients.

A gender wise comparison suggested that there was significant difference in awareness about digital orthodontics (p value = 0.042), and males were more aware of the technologies used in orthodontics as compared to females, (Table 3). Clinical experience of the study population had no significant difference (Table 3). The lack in practice and adoption of digital orthodontics is predominantly because of lack in knowledge regarding the use of these technologies and inadequacy in training of dental team for the same. This can be overcome by attendance of various hands-on courses in the areas of technology and prospective revisions in the under graduate and postgraduate dental curriculum.

A questionnaire-based survey proved to be a useful tool to efficiently acquire information regarding knowledge, attitude and practice of digital orthodontics amongst Orthodontist and Orthodontic Resident of Gujarat. Further studies are required to assess knowledge, attitude and practice of clear aligner therapy among general dentists. Based on these studies, various courses can be designed and conducted for the betterment of patients.

Conclusion

Following Conclusions can be drawn from this study

- i. Orthodontists and orthodontic residents of Gujarat displayed adequate knowledge about digital orthodontics.
- ii. The male orthodontic population is more aware of digital technologies as compared to females.
- iii. Their attitude towards digital orthodontics is positive and they would like to invest in various technologies in future.

The practice of digital orthodontics is lacking, mostly because of the high investment cost that it required.

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