ORIGINAL RESEARCH

Evaluation of Current Trends in the Storage of Orthodontic Records among Orthodontic Postgraduate Students

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Abstract

Aim and objective: This cross-sectional study aimed to evaluate the trends in the storage of orthodontic records among final-year orthodontic postgraduates in India.

Materials and methods: A web-based survey form (Google Form, Google Inc., ABC Alphabet, California, USA) was created and sent to 325 final-year orthodontic postgraduate trainees in India through email and third-party messenger applications. The questionnaire consisted of queries regarding the current method of storage of orthodontic records, the problems being faced storing them, and the recommended method for storing them. The data acquired were subjected to descriptive statistical analysis.

Results: The response rate was 80.6%. The majority of participants stored all their records and 80.5% of them had a history of loss of records. All the participants stored study models in plaster form and 95.8% of participants stored the photographs and radiographs in both hard and soft copy forms. Google Drive was used by 82.8% of participants as their backup and 86.6% of them stored their soft copies in an external hard disk.

Conclusion: Study models in physical forms; photographs and radiographs in both hard and soft copy forms are currently being used and recommended by the majority of the participants. External hard disks have been used by many as a mode of backup of records compared with cloud services. Among participants using cloud services as their mode of backup, Google Drive is commonly being used. Duration of patient's record storage has to be a minimum of 10 years which is not being followed by most of the participants.

Clinical significance: The current trends in various methods of storing orthodontic records help the clinician to know the best method suitable for them in archiving accurate records for longer periods.

Keywords: Archiving, Medicolegal, Orthodontic records, Storage, Study models.

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Introduction

Storage of records when it comes to the field of orthodontics is such an essential aid that it cannot be ignored. Orthodontic diagnosis is based on reliable and accurate orthodontic records. These records that are vital for diagnosing a specific malocclusion and formulate a treatment plan comprise mainly of study models, clinical photographs, radiographs, and clinical examination.[1]

Orthodontic study models help in the careful examination of various parameters, such as dentition, jaw relationships, and make objective measurements for detailed evaluation and treatment planning. The study models are the very first to be acquired in the order of records and are of two types: (1) Physical or plaster models, which are made from well-extended good quality alginate impressions and (2) Digital models or E models which are developed from either 3D scanners or 3D CT.[2]

Orthodontic photography records the external manifestations of health, disease or deformity of the teeth, gingiva or adjacent tissues, and the development of facial features.[3] It includes: (1) Extraoral photographs and (2) Intraoral photographs taken according to the guidelines devised by the American Board of Orthodontics.[4]

Radiographs essential for orthodontic diagnosis and treatment planning include intraoral periapical radiographs (IOPAR), orthopantomogram (OPG), cephalogram (lateral and frontal), and other supplemental radiographs (hand wrist, TMJ views, MRI, CBCT, etc.).[5] These radiographs help in determining the positions, several erupted and unerupted teeth, their periodontal and endodontic status, missing teeth, the dentoalveolar status of both the jaws, temporomandibular joint status, and period of growth.[6]

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Orthodontic records should not only involve the initial data but also every detail regarding the treatment progress of the patient. Thereby they help in situations where a patient gets transferred to another orthodontist and also most importantly, they serve as medicolegal evidence.[7] Therefore, records must be permanent, durable, and unalterable. The production, long-term storage, and archiving of orthodontic records is a vital part of the orthodontist's professional responsibility.[8]

Retention of these records has been done by several methods but in the current literature very little information has been provided regarding the success of these methods, the problems being faced, and the latest methods being followed in terms of developing technology. Therefore, the trends in various methods of storage of orthodontic records form a crucial part from an

ethical and professional standpoint as they would give information regarding the current methods of storage which could help secure the records without any problems for the long term.

This study aimed to evaluate current trends in the storage of orthodontic records followed by orthodontic postgraduate trainees in India. The objectives are to evaluate: (1) the duration of storage of records, (2) current method of storage of records, (3) problems faced in the storage of records, and (4) recommended method of storage of records among orthodontic postgraduate trainees.

Materials and Methods

Study Design and Selection Criteria

The current study is a cross-sectional descriptive survey. The data were collected from only the students currently pursuing final-year orthodontic postgraduation in the year 2021. Other year postgraduate students were excluded from the study due to the lack of experience in the storage of orthodontic records compared with final-year students.

Sample Size Calculation

All the higher educational institutions offering postgraduation in India in 2021 according to the Dental Council of India (DCI) have about 325 final-year postgraduate trainees. Keeping the 15–20% no response rate in online questionnaires in mind, a minimum of 260 responses would bring significant results.

Data Collection

A self-designed closed-ended web-based survey form (Google Form, Google Inc., ABC Alphabet, California, USA) was created and sent to 325 final-year orthodontic postgraduate trainees in India through email and third-party messenger applications.

The form consisted of queries regarding the current method of storage of orthodontic records, the problems being faced storing them, and the recommended method for storing them.

Statistical Analysis

The data acquired were subjected to descriptive statistical analysis by using Statistical Package for Social Sciences software version 24.0 (SPSS Inc., Illinois, Chicago, USA). The value of $p < 0.05$ was considered statistically significant.

Results

Two hundred and sixty-two final-year postgraduate students responded to this survey out of 325 survey forms that were sent. The response rate was 80.6%. The comparison of differences in the distribution of all responses related to general questions on storage, duration, and loss of records are provided in Table 1 and Figure 1. The comparison of differences in the distribution of all responses related to the current method of storing records are provided in Table 2 and Figure 2. The comparison of differences in the distribution of all responses related to problems faced in the storage of records are provided in Table 3 and Figure 3. The comparison of differences in the distribution of all responses related to the recommended method for storing records are provided in Table 4 and Figure 4.

The majority of the participants (97.3%) who responded to this survey stored all their records, out of which 65% stored for a duration of 2–5 years, >5 years (13%), and 1–2 years (10%). 80.5% of the respondents had a history of loss of records. Currently, all the participants stored study models in the form of physical models and 95.8% of participants stored the photographs and radiographs in both hard and soft copy forms.

The major problem faced by 95.4% in storing hard copies was lack of space (4.2%), loss of records (4.2%), and physical damage (4.2%). Currently, 86.6% of participants stored their soft copies in an external hard disk, followed by cloud (internet) storage (26%), the internal hard drive of the computer (12.2%), and CD/DVD drive (0.4%). Problems faced by 90.8% of participants in backing up on hard disk were a corruption of data and physical damage. Problems faced by 91.2% of participants in storing on CD/DVD drive were both damage to the discs and non-availability of CD/DVD drive in current generation computers.

The major problem faced by 86.6% of participants in backing up on cloud (internet) services was the non-availability of internet services (8.8%). Google Drive was used by 82.8% of participants as their backup and the reason being easy to use (11.1%), cheap (1.9%), and reliable (6.5%). The frequency of backing up records was once a month by 84.7% of participants. The recommended method by 76.3% of participants for storing casts was in form of physical models and 93.9% of participants recommended storing radiographs and photographs in both hard and soft copy forms.

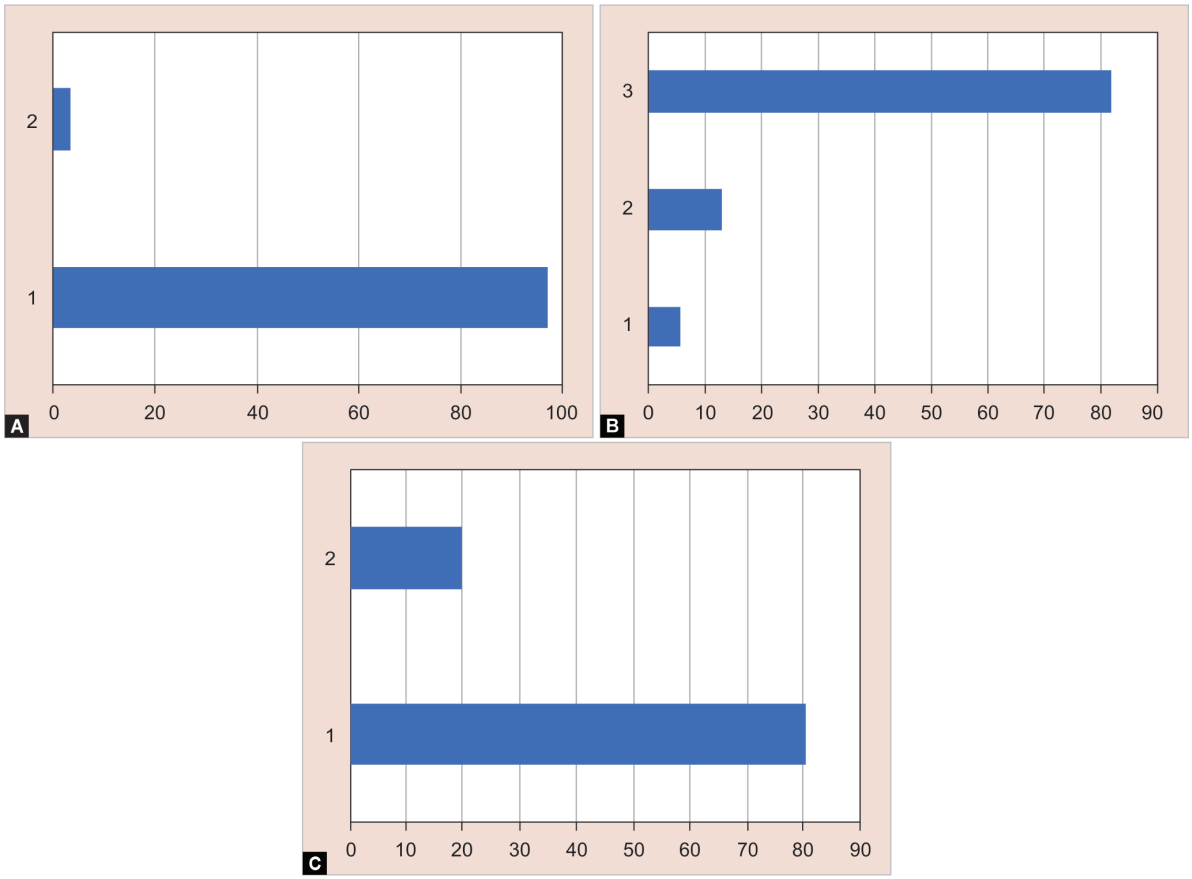
Discussion

When we consider the term "records", the first thing that comes to mind is the initial gathering of information of how the patient presents, so the clinician can formulate a diagnosis, followed by an appropriate treatment plan. Storing these records for the long-term throughout and after treatment is important in terms of medicolegal reasons.[9,10]

Table 1: Comparison of differences in the distribution of responses related to "general questions on storage, duration, and loss of records" domain using Chi-square goodness of fit test

S. no.	*Questions*	*Responses*	*n*	*%*	*p value*
1	Q1—Do you store all of your orthodontic patient records?	Yes	255	97.3	<0.01*
		No	7	2.7	
2	Q2—Average duration of storage of records?	1–2 years	16	6.1	<0.01*
		2–5 years	212	13	
		More than 5 years	34	80.9	
3	Q3—Have you ever lost your patient's records till date?	Yes	211	80.5	<0.01*
		No	51	19.5	

*$p < 0.05$ is considered statistically significant

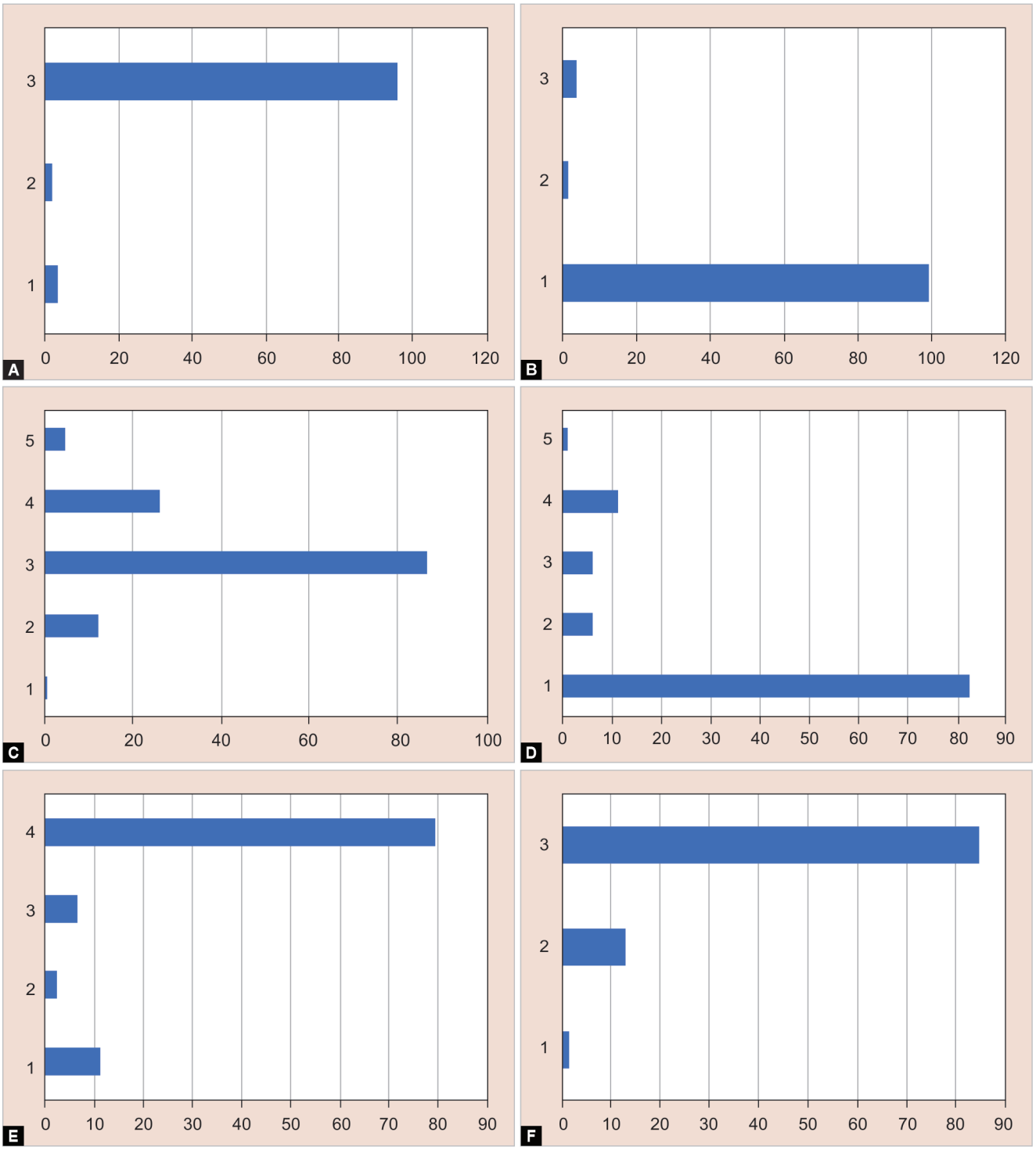


Figs 1A to C: Distribution of responses related to the "General questions on storage, duration, and loss of records" domain. (A) Q1; (B) Q2; (C) Q3

Table 2: Comparison of differences in the distribution of responses related to "current method of storing records" domain using Chi-square goodness of fit test

S. no.	*Questions*	*Responses*	*n*	*%*	*p value*
1	Q4—Your current storage method for storing radiographs and photographs throughout the treatment?	Soft copy	251	3.1	<0.01*
		Printed/hard copy	8	1.1	
		Both hard and soft copy	3	95.8	
2	Q5—Your current method of storing patient's cast?	Physical models	261	99.6	<0.01*
		Scanned models	3	1.1	
		Intraoral scans	10	3.8	
3	Q6—Your current mode of backup of records in soft copy?	CD/DVD	1	0.4	<0.01*
		Internal hard drive	32	12.2	
		External hard drive	227	86.6	
		Cloud storage	68	26	
		All	12	4.6	
4	Q7—Which cloud (Internet) service you use for backup?	Google drive	217	82.8	<0.01*
		iCloud	16	6.1	
		Dropbox	15	5.7	
		Don't use any	29	11.1	
		Email	2	0.8	
5	Q8—What is the reason for choosing the above backup cloud service?	Easy to use	29	11.1	<0.01*
		Cheap	5	1.9	
		Reliable	17	6.5	
		All the above	208	79.4	
6	Q9—How frequently do you back up your patient's records into cloud services/hard drive/CD?	Everyday	4	1.5	<0.01*
		Once a week	34	13	
		Once a month	224	84.7	

*$p < 0.05$ is considered statistically significant



Figs 2A to F: Distribution of responses related to the "Current method of storing records" domain. (A) Q4; (B) Q5; (C) Q6; (D) Q7; (E) Q8; (F) Q9

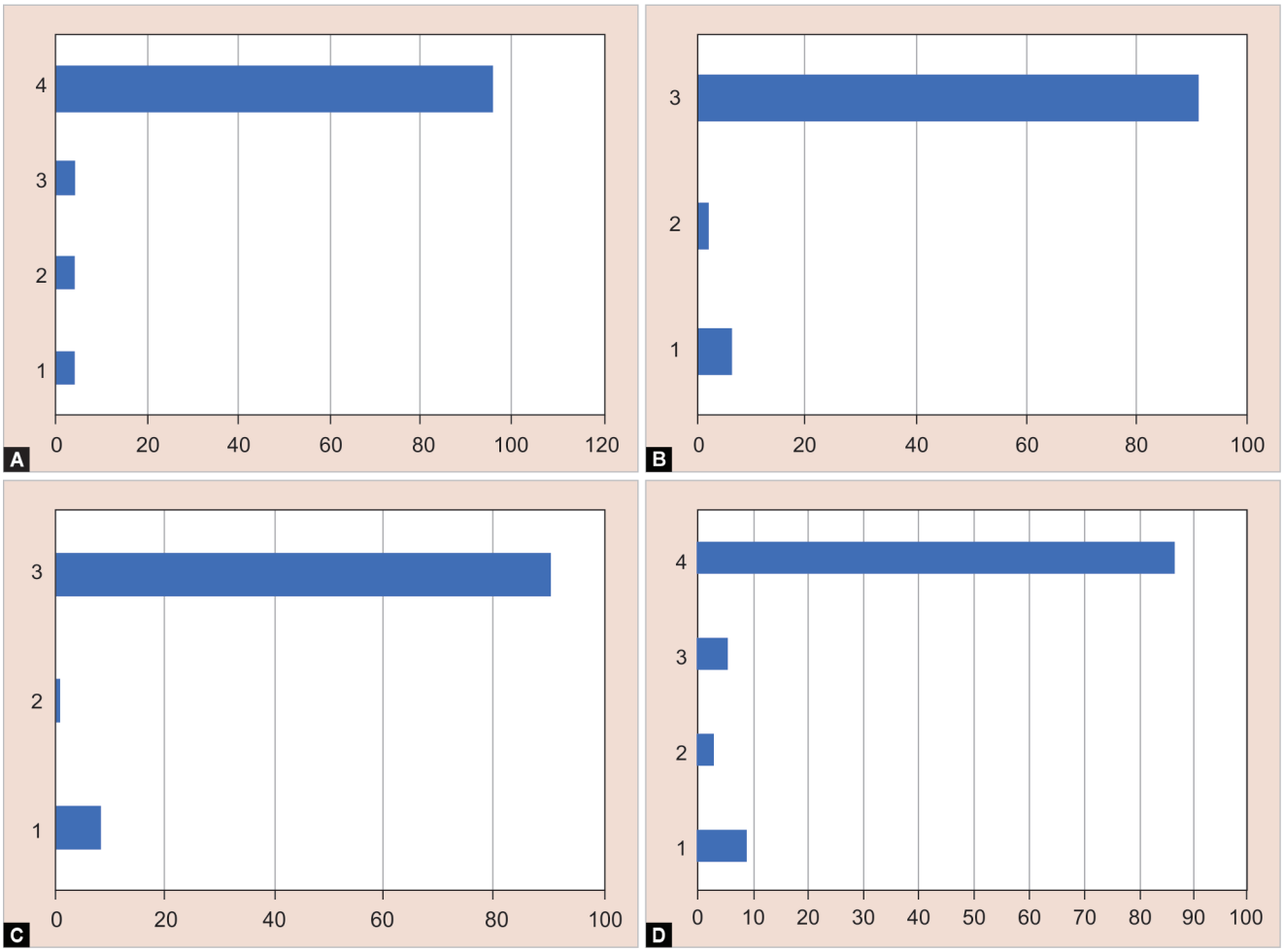
Diagnostic and treatment (pre, mid, post) records include patient's study models, photographs, and radiographs. All these records are available in either physical or digital forms when it comes to studying models whereas the radiographs and photographs can be stored in soft copy or hard copy forms. In the present study, all the records were stored by the majority of participants, among which there is a history of loss of records at some point by 75% of participants. So, it becomes a necessity to evaluate the problems being faced in storage so that loss of records can be prevented to a maximum extent.

The average duration of storage of records by the majority of participants was 2–5 years followed by >5 years, whereas the American Dental Association (ADA) recommends storing dental records for at least 10 years.[11–13]

Table 3: Comparison of differences in the distribution of responses related to "problems faced in the storage of records" domain using Chi-square goodness of fit test

S. no.	*Questions*	*Responses*	*n*	*%*	*p value*
1	Q10—Problems faced, or you could face while storing the hard copies?	Lack of space	11	4.2	<0.01*
		Physical damage	10	3.8	
		Loss of records	11	4.2	
		All the above	250	95.4	
2	Q11—Problems you faced, or you could face while backing up on CD/DVD?	Damage to disk	17	6.5	<0.01*
		Availability of CD/DVD drive	6	2.3	
		Both	239	91.2	
3	Q12—Problems you faced, or you could face while backing up on hard drive?	Corruption of data	23	8.8	<0.01*
		Physical damage	1	0.4	
		All the above	238	90.8	
4	Q13—Problems you faced, or you could face while backing up on cloud services	Availability of Internet	23	8.8	<0.01*
		Cost	7	2.7	
		Limited storage space	14	5.3	
		All the above	227	86.6	

*$p < 0.05$ is considered statistically significant



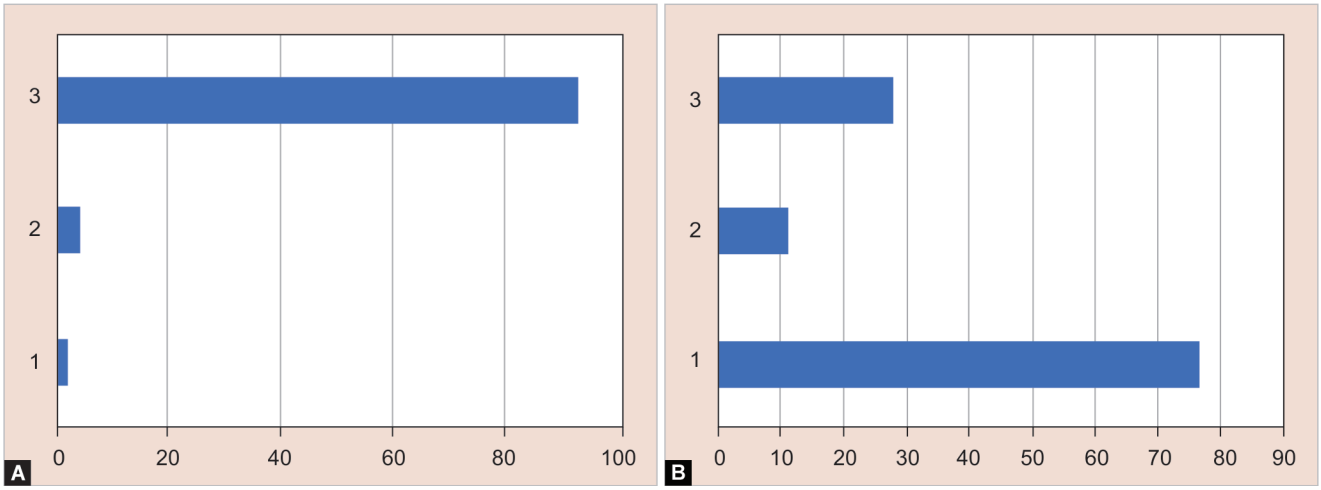
Figs 3A to D: Distribution of responses related to the "Problems faced in the storage of records" domain. (A) Q10; (B) Q11; (C) Q12; (D) Q13

Orthodontic study models have been a "Gold Standard" with varying advantages such as being a routine dental technique, easily producible and reproducible, cost-effective, and easily measurable in three dimensions. Study models are available in either physical form, i.e., the plaster casts or the digital form. Rheude et al.[14] and Kumar et al.[15] found that in most clinical situations digital models can be successfully used and has their own advantages compared with physical models. All the participants in this study currently

Table 4: Comparison of differences in the distribution of responses related to "recommended method for storing records" domain using Chi-square goodness of fit test

S. no.	*Questions*	*Responses*	*n*	*%*	*p value*
1	Q14—Your recommended method for storing radiographs and photographs?	Hard/physical copy	5	1.9	<0.01*
		Soft copy	11	4.2	
		Both	246	93.9	
2	Q15—Your recommended method for storing casts?	Physical plaster casts	200	76.3	<0.01*
		Scanned casts	30	11.5	
		Intraoral scans	73	27.9	

*p <0.05 is considered statistically significant



Figs 4A and B: Distribution of responses related to the "Recommended method for storing records" domain. (A) Q14; (B) Q15

stored study models in the form of physical plaster casts and also recommend using them when compared with scanned models or e-models. This implies the conventional physical model form is still being followed majorly. This implies that the majority of the higher degree colleges are currently are using plaster models compared with digital models. Among the minor number of participants who are currently employing intraoral scans for digital models use the "3 SHAPE" Company intraoral scanner. In the current study, the use of digital models by intraoral scans is being recommended by 43% of the participants suggesting a trend toward increased use of digital models in the future.

Radiographs and photographs are currently being stored in both hard and soft copy forms by the majority of the participants. Soft copies of the records are being stored in the external hard disk by 56% of participants followed by cloud (internet) services (37%), internal hard drive (36%), and very few save on CD/DVD discs and email (1%). The major reason given by participants for not storing on CD/DVD discs is the non-availability of CD/DVD drive in current generation computers followed by damage to discs. Even though cloud (internet) services are the latest in technology compared with other modes of storage, the problem(s) participants faced with them were mainly the availability of internet services followed by cost and limited storage space. Google Drive was used by 55% of participants as their backup and the reason being easy to use, cheap, and reliable compared with other services. Backup of records was done once a month by most of the participants.

Limitations

This study is a self-designed web-based survey, sent to those pursuing final-year postgraduation in orthodontics in 2021 through different third-party social messengers such as email, WhatsApp groups, etc., and so the non-response rate was 19.6%. Irrespective of this, the main purpose of this study was to gain knowledge regarding the current methods on successful storage of orthodontic records and problems being faced in archiving them.

This study could be more beneficial when a further survey is done not only involving the students but also various academicians and private practitioners.

Conclusion

Study models in physical forms; photographs and radiographs in both hard and soft copy forms are currently being used and recommended by the majority of the participants. External hard disks have been used by many as a mode of backup of records compared with cloud services. Among participants using cloud services as their mode of backup, Google Drive is commonly being used. The duration of storage of records has to be a minimum of 10 years which is not being followed by most of the participants.

References

1. Han UK, Vig KW, Weintraub JA, et al. Consistency of orthodontic treatment decisions relative to diagnostic records. Am J Orthod

Dentofacial Orthop 1991;100(3):212–219. DOI: 10.1016/0889-5406(91)70058-5.
2. Kharbanda OP, ed. Clinical evaluation. In: Diagnosis and management of malocclusion and dentofacial deformities. 2nd ed., India: Elsevier; 2013. p. 169.
3. Heimlich AC. Dental photography: its application to clinical orthodontics. Angle Orthod 1954;24(2):70–78.
4. https://www.americanboardortho.com/.
5. Bhalajhi SI. Orthodontics – The art and science. 7th ed., Arya MEDI Publishing house Pvt. Ltd.; 2018. p. 159.
6. Bishara SE. Textbook of orthodontics. Saunders; 2002. p. 112.
7. Skifkas PM. Guarding the files. Your role in maintaining the confidentiality of patient records. JADA 1996;127:124852.
8. Lawney M. For the record. Understanding patient recordkeeping. NY State Dent J 1998;64(5):34–43.
9. WHO Medical record manual a guide for developing countries. 2006; ISBN 92 9061 0050.
10. Astekar M, Saawarn S, Ramesh G, et al. Maintaining dental records: are we ready for forensic needs? J Forensic Dent Sci 2011;3(2):52–57. DOI: 10.4103/0975-1475.92143.
11. Dental Records. American Dental Association 2010.
12. https://www.aapd.org/globalassets/media/safety-toolkit/dental-records-ada.pdf.
13. Presavento & Pesavento, LTD, CPAs, "Records retention schedule," Collier, Sarner and Assoc Newsletter, Berwyn, IL, May 15, 2005.
14. Rheude B, Lionel Sadowsky P, Ferriera A, et al. An evaluation of the use of digital study models in orthodontic diagnosis and treatment planning. Angle Orthod 2005;75(3):300–304.
15. Kumar AA, Phillip A, Kumar S, et al. Digital model as an alternative to plaster model in assessment of space analysis. J Pharm Bioallied Sci 2015;7(Suppl 2):S465–S469. DOI: 10.4103/0975-7406.163506.