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Shoro, Suman; Murad Shah Syed, Falak ; Manica, Scheila

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## Forensic Anthropology

## Awareness and importance of forensic odontology amongst faculty members and students of dental institutes in Pakistan

Suman Shoro <sup>\*</sup>, Falak Murad Shah Syed, Scheila Mânica

Centre for Forensic and Legal Medicine and Dentistry, 2 Park Place, Dundee, DD1 4HR, University of Dundee, Scotland, UK

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## ABSTRACT

Forensic odontology (FO) is taught worldwide but was not being taught in Pakistan until recently. This study aimed to assess awareness and acknowledgement of FO amongst dental faculty members and students of dental institutes in Pakistan at the undergraduate level. Two sets of questionnaires (Q\_1-faculty/Q\_2-students) consisting of 12 closed-ended questions were distributed in 34 public/private dental institutes. Data was qualitatively analysed in Microsoft Excel 2018. A total of 145(Q\_1) and 1017(Q\_2) responses were received. 98 % dental faculty members and 86 % students believed FO should be taught to Pakistan's undergraduates. According to 56 % dental faculty members, FO should be taught as an independent subject as opposed to other members who suggested to merge FO with Oral Biology (32.4 %) or Oral & Maxillo-Facial Surgery (24.1 %). The teaching should take place during the second last or final year (68 %) with a weekly schedule of one-hour class session (53.8 %). Results also showed 80 % students are interested in receiving formal training. They expressed great interest in human identification and facial reconstruction. In conclusion, the dental council of Pakistan must liaise with dental institutes in order to devise a framework of guidelines or minimum requirements to deliver the teaching in FO.

## Introduction

Forensic Odontology (FO) is an important branch of Odontology but only a few countries offer courses in this subject. Previous studies have highlighted that more teaching and research is fundamental for this field; also, the subject should be a part of the dental undergraduate curriculum [1]. In the past, modules for FO teaching had been designed for dental undergraduates which would help dental students to assist forensic odontologists or enhance their level of interest for training in the future [2].

Forensic Odontology is listed as one of the topics under Oral & Maxillofacial Surgery in the undergraduate dental curriculum of Pakistan [3] but the teaching and training is yet to be fully developed and implemented. In 2019, some private dental colleges have publicized job vacancies in local newspapers and job websites for teaching FO in dental institutes [4–6]. Furthermore, FO had been listed as one of the five optional specialties in the latest framework for medical and dental schools by Pakistan Medical & Dental Council (PM&DC) [7].

The identification of president Zia-ul-Haq in 1988 is the earliest known case where FO was used in Pakistan [8] and till date, not much progress had been made. The lack of progress over so many years had thus prompted the main author to explore the level of awareness and

acknowledgement of FO within the concerned dental faculty members and the level of basic dental knowledge and interest amongst students of dental institutes in Pakistan.

## Methodology

A cross-sectional study based on convenience sampling due to limitations was carried in anonymized public and private dental institutions in Pakistan recognized by PM&DC. The data collection was performed in two phases (Phase 1: July-August'18 and Phase 2: December'18-January'19) The areas were divided such that regions below the line drawn on the map in Fig. 1 were covered in Phase 1 while those above were covered in Phase 2.

In Pakistan, 49 dental institutes are recognized by the official governing body PM&DC of which 14 are public ones [9].<sup>1</sup> All institutes of Sindh were included in the study as it was the main author's home province. For the other provinces, all public and private institutes established before 2010 and those which were accessible based on financial and terrestrial concerns were included (as data was collected by road travel).

Two set of questionnaires (Q\_1 and Q\_2), each consisting of 12 closed-ended questions, were designed and prepared using Microsoft Word 18. The questionnaires were presented in English (U.K) because that is the primary teaching language of curriculums in institutions in Pakistan. The questions of both questionnaires can be viewed in Table 1.

<sup>\*</sup> Corresponding author: Present address: Quaid Villa 96, Street 3, Precinct 2, Bahria Town Karachi, Sindh, Pakistan.

E-mail addresses: [shorosuman@gmail.com](mailto:shorosuman@gmail.com) (S. Shoro), [falakmshah93@gmail.com](mailto:falakmshah93@gmail.com) (F.M.S. Syed), [s.manica@dundee.ac.uk](mailto:s.manica@dundee.ac.uk) (S. Mânica).

<sup>1</sup> Website was accessed on 09/09/2018.



**Table 1**  
Questions of Questionnaire 1 (Faculty) and Questionnaire 2 (Students).

#	Questionnaire 1 (Dental Faculty)	Questionnaire 2 (Dental Students)
1	Does your hospital or institution have a forensic odontology/dentistry department?	After examining the full mouth of the patient, do you make a complete dental chart as a dental record of your patients?
2	Are you aware that forensic odontology/dentistry is recognized as a subject/sub-subject for the undergraduate BDS curriculum by PMDC?	Do you maintain the dental chart and history taken of the patient as a record?
3	IF YES, then are you aware whether it is listed as an independent subject (a separate subject on its own) or a dependent one (a branch of another specialty)?	In your opinion, for how long should the dental records of a patient be maintained? <b>1–2 years.</b> <b>2–5 years.</b> <b>More than 5 years.</b> <b>Others</b>
4	Are you aware of any dental institutions in Pakistan that teach forensic odontology/dentistry?	In your opinion, which of the following records of a patient should be maintained? (you can select more than one) <b>Patient case record.</b> <b>Radiographs.</b> <b>Photographs.</b> <b>Cast.</b> <b>Other</b>
5	Are you aware of any forensic odontologist(s) working in Pakistan?	Have you received any practical training in tooth morphology using real teeth for the purpose of identification (inside and outside jaws)?
6	Do you know of any case(s) where forensic odontology has been applied? (inside and/or outside Pakistan)	Keeping in view the anatomy of all the individual crowns and roots, do you consider people's dentition to be different from one another?
7	Have you ever received any sort of training or attended any lectures, seminars or workshops on forensic odontology/dentistry (undergrad/postgrad level)? If yes, please specify which and when: <b>Training Workshop Lecture Seminar</b> <b>Within last 2 years Between 2–5 years</b> <b>More than 5 years ago</b>	Please select Yes or No for the following based on your knowledge: A- Can teeth serve as a source of DNA? B- Can teeth be used for identification of people? C- Can teeth act as an aid for the estimation OR assessment of age? D- Can teeth help with ethnicity assessment and sex estimation? E- Can teeth be one of the primary identifiers in mass disasters? F- Can dentists play a role in mass disasters? G- Can dentists testify as expert witnesses in court to present dental evidence?
8	Do you think students in Pakistan should be taught forensic dentistry in their undergrad level?	Are you aware of a branch of dentistry known as forensic dentistry or forensic odontology?
9	If PMDC decides to teach forensic odontology/dentistry as part of the BDS curriculum, then should it be taught as a dependent subject or an independent one?	If yes, then what is your source of knowledge about forensic dentistry? (you can select more than one) <b>Workshop/lectures in college.</b> <b>Media.</b> <b>Newspaper Professor/colleague/friend Other</b>
10	If PMDC decides to teach Forensic Odontology/Dentistry as a dependent subject, which subject should it be taught under? <b>Oral &amp; Maxillo Facial Surgery.</b> <b>Oral Biology.</b> <b>No opinion at present.</b> <b>Other</b>	Should undergraduate students in Pakistan be also taught this subject to be given an equal chance to excel in their careers?
11	In which year of the BDS curriculum should forensic odontology/dentistry be taught? <b>Basic Years (1 or 2).</b> <b>Core Years (3 or 4).</b>	Would you, on a personal level be interested in receiving formal training in forensic dentistry?
12	What should be the suggested frequency of the classes to be scheduled? <b>Once a week for 1 h.</b> <b>Once a week for 2 hrs.</b> <b>Twice a week for 1 h.</b> <b>Twice a week for 2 hrs.</b> <b>Other</b>	Which of the following could be a subject of interest for you? (you can select more than one) <b>Identification of people/remains.</b> <b>Bite-mark analysis</b> <b>Disaster Victim Identification.</b> <b>Age Estimation</b> <b>Identifying Dental Malpractice.</b> <b>Weapon-mark Analysis</b> <b>Identifying abuse, neglect, violence.</b> <b>Sex Estimation.</b> <b>Facial Reconstruction.</b> <b>None</b>

hospitals even though 2% dental faculty members stated otherwise. The results of this study coincide to the study conducted in 2014 wherein all participants agreed there was no FO department or that they were not aware [12].

Furthermore, FO has been given five didactic hours as a dependent subject/topic under OMFS in the undergraduate dental curriculum by PM&DC [3] yet more than 50 % dental faculty members was not aware of its inclusion and another 90 % was not aware of any institutes where FO was being taught. There seems to be a lack of interest and acknowledgement by dental specialists to other fields of dentistry. There has also been an insufficient role by the PM&DC in administering better protocols and regulations for understanding and implementation of the curriculum.

There are only few trained specialists, and there is scarcity of teaching materials and funding.

Contrary to the poor awareness of the status of FO in the field of academics in Pakistan, about 54 % of the participants were aware of a few cases in Pakistan where FO had been applied. Moreover, 83 % of students stated they are aware of the field which supports the results of a study conducted in Karachi wherein 86.2 % of the students agreed that FO is an important branch of dentistry [10].

Reasons for recent awareness could include media and increase in publications on the subject. The role played by media highlighted the help of FO in a high-profile murder case in Karachi and on the identification of victims of Pakistan International Airline (PIA) plane crash [14,15]. As

**Table 2**  
Total Number of Responses from Institutes around Pakistan.

Code of Institute	No. of Responses from Q_1	No. of Responses from Q_2	Code of Institute	No. of Responses from Q_1	No. of Responses from Q_2
001-B-ii	4+	30	018-C-vi	*5	30
002-D-xii	**3	30	019-C-vi	4	30
003-C-ix	4	30	020-D-x	*5	30
004-B-ii	4	30	021-D-xii	4	*51
005-B-iii	*5+	30	022-D-xii	*5	30
006-D-xii	4	30	023-B-iv	*5	30
007-D-xii	4	*35	024-C-vii	*5	*37
008D-xiv	*6+	30	025-D-xii	4	30
009-D-xiii	*6+	30	026-D-xi	4	30
010-A-i	*5	30	027-C-ix	**3	*41
011-C-vii	4	30	028-C-viii	**3	30
012-C-vii	4	30	029-C-viii	4	30
013-D-xii	*7+	*38	030-C-v	*7	*35
014-D-xii	4	30	031-B-iv	*5+	30
015-D-xii	4+	30	032-D-xii ^^	0 ^^	0
016-C-vii ^^	0 ^^	0	033-D-xii	*5	30
017-D-xii	4	30	034-D-xii	*5	30
Total No. of responses for Q_1 = 145			Total No. of responses for Q_2 = 1017		

\*More than required sample.

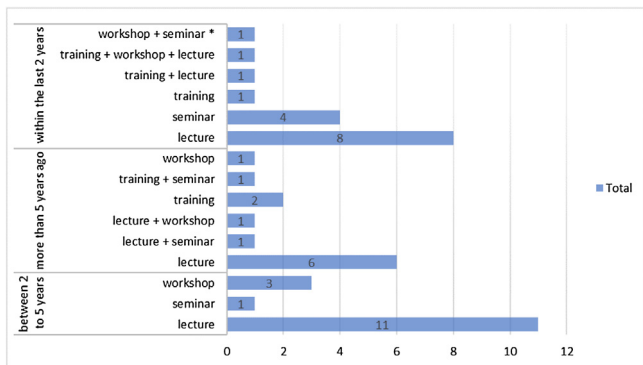
\*\*Less than required sample.

+ Response from a speciality not required originally.

^^ Permission not granted.

**Table 3**  
Distribution of questions in accordance with concept of content.

TOPICS	Question Number from Q_1	Question Number from Q_2
Awareness of FO in Pakistan	1 – 6	8 – 9
Acceptance, Acknowledgement and Interests of FO as a taught subject	7 – 12	10 – 12
Importance and Maintenance of Dental Records in Pakistan amongst Students	–	1 – 4
Knowledge of Basics of Oral Biology and Factual Information about FO amongst Dental Students in Pakistan	–	5 – 7



**Fig. 2.** When and How was the Training Received by faculty members (y axis = types of training; x axis = total number of faculty members for each type pf training per number of years) \*Hands on experience in DVI Case.

more disasters strike in the world and increase in violence can be observed, there has been increased coverage of cases involving forensic odontologists.

*Acceptance, Acknowledgement and Interests of FO as a taught subject*

Due to low number of skilled forensic odontologists in Pakistan, there has been difficulty to report and solve medico-legal cases related to dentistry [16]. Several research papers have emphasized on the need to include FO in the undergraduate dental curriculum in Pakistan [10–13,17].

Out of 145 dental faculty members, 81 (56 %) opined that FO should be taught independently. Around the world, FO is taught being dependent

under another speciality of dentistry. Thus, when further asked which subject FO should be dependent under, majority of the participants stated oral biology (32.4 %) followed by OMFS (24.1 %). Several participants also suggested oral pathology and oral medicine.

It is believed that FO is a field depending on several other subjects in dentistry such as oral pathology, oral medicine, oral diagnosis, oral biology, dental jurisprudence, radiology, oral surgery, community and preventive dentistry [18]. Curricular guidelines established in 1982 and 1990 and American Academy of Oral Pathology had suggested FO to be taught under oral pathology, or oral diagnosis/medicine [18–20]. It was later believed FO should exist under oral biology [21,22]. However, it has also been agreed over numerous times in previous years that concepts of FO are not unique to one discipline and an independent department of FO is required [19–21,23].

This multidisciplinary field requires knowledge of basic sciences and preferably of some clinical dental sciences [20]. It has also been suggested that topics requiring clinical expertise should be introduced in core years [24]. Thus, its teaching is most suited when the students have had most courses of theory already, preferable in the final year [18–20].

Considering the schedule of classes in the curriculum, majority of the participants suggested once a week for one-hour class (53.8 %) followed by twice a week for one-hour class (27.6 %). There have been recommendations in the past on model curriculum of FO suggesting classes of about 15–25 h; or a minimum of 26–28 h in semesters [2,19].

*Importance and maintenance of dental records in Pakistan amongst students*

Dental records are legal and official documents of a patient which have the data of dental status, diagnosis and treatment of the patient, thus

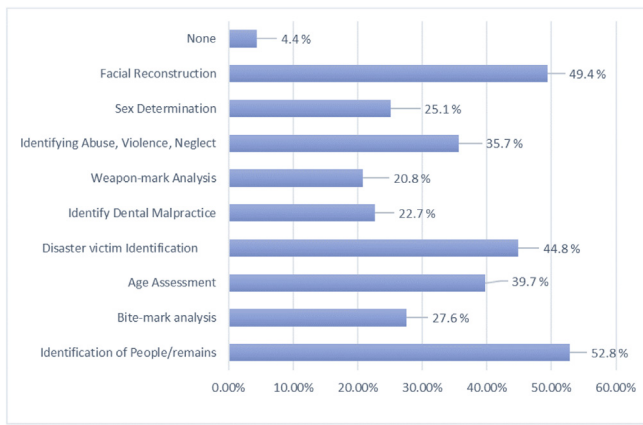


Fig. 3. Topics of interest of dental students in FO (x axis = percentage representation of students from a total of 1017 participants individually).

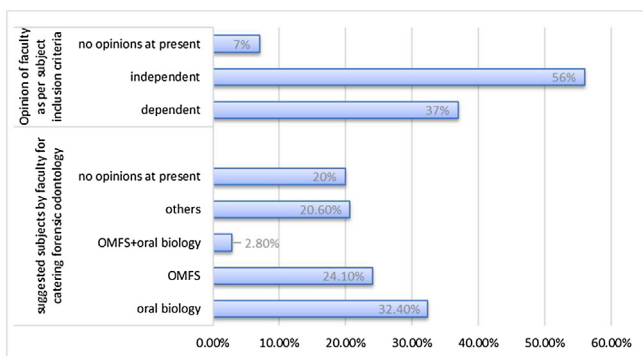


Fig. 4. Opinions of faculty members for subject inclusion criteria as dependent or independent; as well as of preferred subject under which FO should be catered (x-axis represents percentage of faculty members from 100 % for each component).

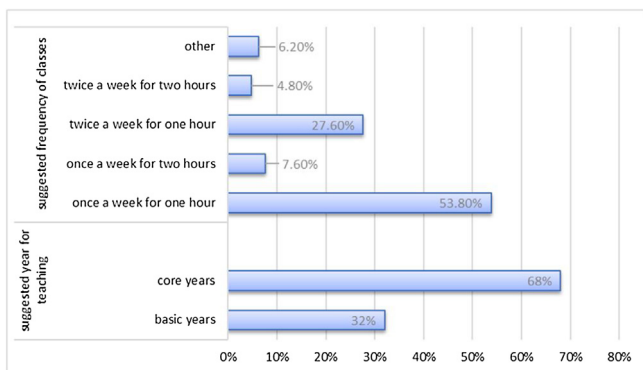


Fig. 5. x-axis represents percentage of faculty as per their opinion regarding inclusion of subject in year of study and frequency of classes.

ideally, they should be stored for as long as possible [25].

European countries, UK, USA, Canada; have legislative mandates regulating dental record keeping [26]. Based on the knowledge and experience of the main author, it can be stated that such a legislation is absent in Pakistan.

The responses proved a variability in record keeping practices in dental institutes in Pakistan. Radiographic comparison is one of the most reliable and effective identification procedures [27]. A study in Pakistan also concluded that dental clinics should record and keep casts along with other dental data throughout the lifetime as rugae can help with human identification [28]. A less than 60 % of students responding to preserve radiographs and less than 30 % to casts is a poor result.

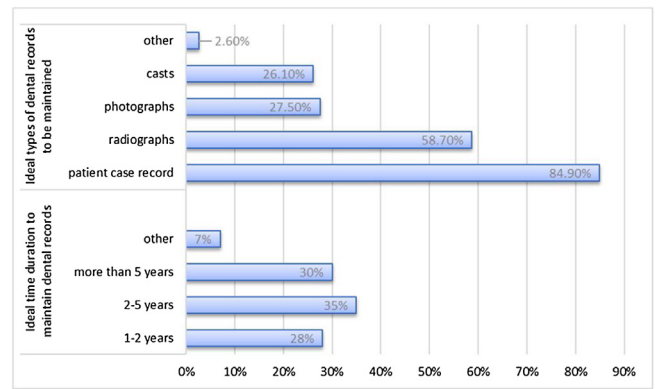


Fig. 6. x-axis represents percentage of students stating ideal types of dental records to be maintained along with the ideal time duration for maintenance.

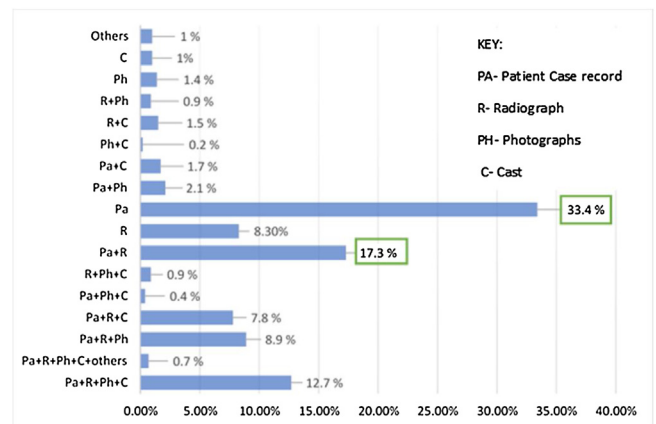


Fig. 7. Combinations of Dental Records Deemed Important by Students for Maintenance (x axis = percentage of students representing 1017 participants in total).

A study in 2017 revealed that there is a lack in dental record management in Pakistan. 52.4 % revealed that they were not taught dental record management at an institutional level as part of their curricula [10]. The problem for Pakistan lies in the proper recording and maintaining of the records. Neither are there proper protocols or rules and regulations lined down by the council, nor are dental records adequately taught in institutes. Strict policies and proper protocols regarding teaching and maintenance of dental records must be formed. In armed forces, it is compulsory to maintain dental records and similar compulsion must be followed in civilian hospitals and institutes [29].

*Knowledge of basics of oral biology and factual information about FO amongst dental students in Pakistan*

More than 50 % students stated they had received practical training on real teeth for identification purposes however, when the results were assessed institution wise, a great variation of responses from students studying in same institute was found. Oral biology and tooth anatomy are taught by second year of dental curriculum in Pakistan [3] thus most responses should have been similar. This variation could have been due to negligence on students' parts as to not have attended the training and thus not being aware of it. It could also be due to misunderstanding of the question as mostly students in Pakistan are trained on real teeth in the department of operatives and endodontics for restorative filling and root canal treatments. It had been highlighted in a previous study that morphological aspects of teeth of Pakistani population are different in terms of racial and ethnic considerations and thus tooth morphology must

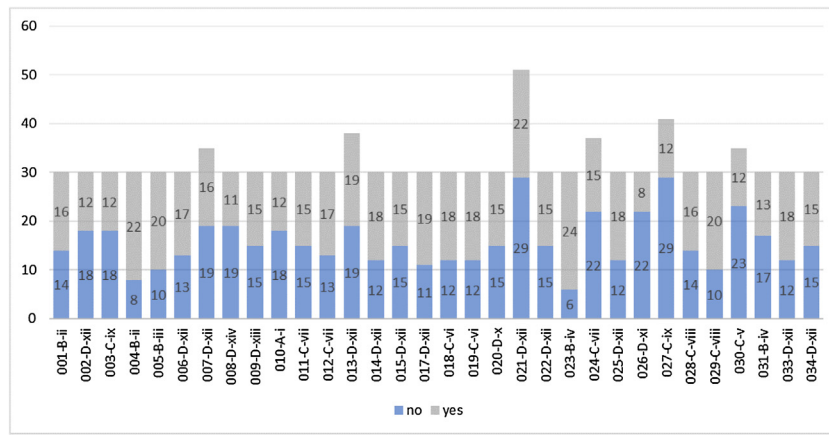


Fig. 8. Training received by dental students on real teeth for identification in each institute (x axis = codes for each institute; y axis = total number of students in the sample per institute who stated whether they had received the training or not).

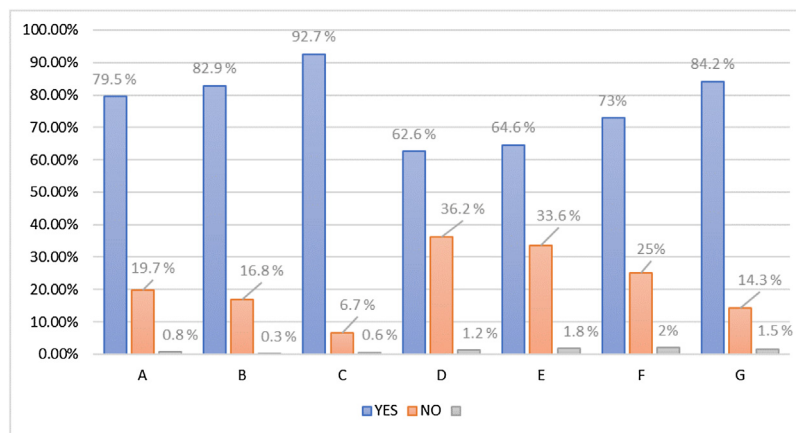


Fig. 9. Dental and Forensic Odontology Context Questions for dental students (y axis = total percentage fraction of students giving correct or incorrect responses for each part- where blue = correct response, red = wrong response, grey = no response given. Each part of question has been denoted a 100 % which represents total 1017 students. x axis = parts A to G of question 7 of Q\_2).

be taught accordingly [17]. This could only be achieved if all institutes provide training of tooth morphology on real teeth from Pakistani population.

Question 7 in Q\_2 consisted of a series of 7 questions in a yes or no answering format. According to the author’s opinion, correct responses above 75 % were considered positive. Thus, only parts ‘A’, ‘B’, ‘C’ and ‘G’ are considered constructive.

Teeth are one of the three primary identifiers according to INTERPOL [25] which is yet not a commonly known fact by students in Pakistan. As the knowledge of FO is not adequate, students might not be aware of how valuable the role of teeth is. This subject is still not taught in Pakistan, thus explaining a poorer knowledge in some aspects of FO. Individuals have been aware of FO’s role in human identifications, age, DVI and medicolegal cases because of increased number of similar cases in Pakistan which are being exposed by media. No such cases have come to limelight regarding assessment of sex or ethnicity on individuals resulting in poorer awareness regarding these aspects compared to other aspects of FO.

With the most recent advancement in Pakistan – induction of two forensic odontologists at a public institute in Karachi [30], there is now hope that there will be considerable improvement in the knowledge and awareness regarding forensic odontology in Pakistan. People are beginning to acknowledge the importance of this dental speciality which would eventually help to improve FO’s standing in the country.

### Conclusion

Dental faculty members in Pakistan are aware of FO but most of them are neither familiar with its inclusion as a topic/subject in the dental undergraduate curriculum nor about the availability of forensic odontologist(s) in Pakistan. Majority of the students showed awareness but their level of information regarding scope of FO is variable. The students have also shown a positive response regarding recording and maintaining dental records however they lack the knowledge of the methods and time duration used for the maintenance of dental records.

Exposure of FO to the undergraduates highlights professional obligation of accurate dental documentation and emphasis in its role in human identification and in identifying any forms of child abuse and its signs and in management of other medicolegal cases involving violence and trauma.

There must be liaison between the dental institutes and the council to form an interdisciplinary FO section followed by measures to inculcate students and practitioners about the aspects of this field. Finally, guidelines and minimum requirements for teaching the subject should be established and protocols for standardizing the charting and recording system should be recommended to institutes and to private and public dental practices.

## Declaration of Competing Interest

The authors declare no conflicts of interest.

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