

Awareness of Forensic Odontology among Dentists in Pakistan and its Impact on Dental Record Keeping

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ABSTRACT

Background: Forensic odontology (FO) has an important role to play in the field of forensic science to gather evidence for human identification. Dental records form an integral component of forensic evidence in this regard. Dental practitioners need to be aware of the legal significance of dental record keeping. They should be able to provide accurate information on which forensic evidence can be based.

Aim: To assess the awareness regarding FO and dental record-keeping practices amongst dental practitioners in Pakistan.

Methods: A cross-sectional study was conducted among dental practitioners to assess the awareness regarding FO and dental record-keeping in clinical practice.

Results: A total of 380 responses were received. Results showed that only 2% of the respondents studied the subject of forensic dentistry at the undergraduate or postgraduate level. 88% of the individuals were interested in receiving formal training in forensic dentistry and 96% recommended the subject of forensic dentistry to be introduced as a separate postgraduate training program in Pakistan. More than half of the respondents reported a lack of record-keeping in their clinical practice.

Conclusions: Limited awareness was observed regarding FO among dental practitioners in Pakistan primarily due to lack of exposure to the subject. In terms of dental record keeping, a limited number of practitioners in our study reported adhering to it. Hence, there is a need to develop measures to promote awareness and knowledge about FO and dental record management in Pakistan.

Keywords: Forensic odontology, awareness, education, dental records, dental identification.

INTRODUCTION

Human identification is one of the major aspects of research in the field of forensic science. In today's society, it has become highly relevant for legal, financial and compassionate reasons^{1,2}. In this regard, dental science has a lot to offer in cases of legal investigations for detection of human remains after aviation accidents, natural disasters, criminal investigations and terrorist attacks^{2,3}. It also assists legal authorities in the determination of human age, gender, ethnic origin and facilitates bite marks analysis particularly in cases of child abuse and rape victims^{3,4}. Forensic odontology (FO) is a rapidly developing branch of forensic science that deals with the identification, documentation and presentation of dental evidence in the interest of law^{5,6,7}. This involves careful review, evaluation and presentation of dental evidence as a scientific and objective contribution in legal proceedings⁸. Dental records play an important role and form the basis for dental evidence in this regard. It is the official dental office document that contains all information related to diagnosis, clinical notes, treatment performed, treatment consent and patient-related communications^{9,10}. By following the principles of record management, dental practitioners can ensure that all information that may have a forensic value, is properly maintained and retrievable. Good quality dental records are an essential part of patient care. It includes all clinical notes, communication, radiographs, extra and intraoral photographs, dental casts and all clinical investigations performed during treatment^{5,6}.

Since very few qualified forensic odontologists are working in Pakistan, several research papers have emphasized and suggested to include FO as an individual subject in the undergraduate dental curriculum¹¹⁻¹⁴. On the other hand, there is also a need to raise awareness among dental practitioners about the significance of dental identification through comprehensive and accurate record keeping. Here, the question arises as to what extent dental practitioners should be aware of FO and what

potential role dental record-keeping can play in forensic science. In this context, our study aimed to analyze and assess the level of awareness about FO among dental practitioners in all provinces of Pakistan. Such studies have previously been done in two provinces of Pakistan. However, the data from the remaining provinces are missing in this regard. Thus, a cumulative sample will help in improving the evidence in this domain.

The objectives of this study were to assess the level of awareness of dental practitioners about forensic dentistry in Pakistan and to investigate their record-keeping practices.

METHODS

A cross-sectional study was conducted among dental practitioners across Pakistan, during an estimated time of two months using a self-administered online questionnaire. Ethical approval was granted by the Institutional Review Board at [blinded for peer review]. Informed written consent was obtained from all study participants before data collection. The study conformed to strobe guidelines for cross-sectional studies. The sample size was calculated to be 380, using the WHO formula with 95% confidence and a 5% margin of error. Dentists practicing in Pakistan for more than 2 years with age range of 23-75 years and having a valid Pakistan Medical Commission license were included in the study.

A closed-ended questionnaire was divided into three sections consisting of questions regarding demographic information (Section I), awareness regarding forensic dentistry (Section II) and participant's record-keeping practices (Section III). Section II included a Likert-type scale to allow respondents to specify their level of agreement or disagreement to the statements from strongly disagree to strongly agree. Similarly, section III also included a Likert-type scale of 0-3 representing never, sometimes, often and always. Awareness level criteria were categorized as mentioned in Table 1. The data obtained were analysed using SPSS-23. Chi-square tests were used to compare the awareness among dental practitioners, post-graduate residents and specialists with a level of significance set at $P \leq 0.05$.

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Table 1: Awareness level criteria

Awareness level	Scoring percentage
High awareness	80% and above
Intermediate awareness	60% - 80%
Low awareness	Less than 60%

RESULTS

A total of 380 dentists were enrolled in this study from different cities in Pakistan. The mean age of respondents was 31 years SD +/- 11.21. The majority of the respondents were female with a male to female ratio of 1:3. Among them, 48% of the respondents were graduates, 37% post-graduate residents and 15% specialists. More than half of the respondents (54.2%) belonged to the private sector, 31% to the public sector, while 14% worked both in public and private set-up. Majority of the respondents (62.5%) were from Punjab, (14.2%) from Sindh, (16.1%) from Khyber Pakhtunkhwa, (4.2%) from Balochistan and (2.9%) from Gilgit-Baltistan. Exposure to the subject or cases of forensic dentistry is listed in figure 1. Only about 2% of respondents studied the subject of forensic dentistry at the undergraduate or post-graduate level.

Eighty eight percent of the individuals were interested in receiving formal training in forensic dentistry and 96% recommended the subject of forensic dentistry for postgraduate training program (Fig. 2). Significant correlation was found between the designation of respondents and awareness regarding forensic dentistry with $p < 0.5$ as given in table 2. In terms of record-keeping practices more than half of the respondents reported that they do not maintain dental casts, extra/ intraoral photographs, dental charting, serial number of implants and prosthesis identification marks. Radiographs were reported to be the most retained dental record as shown in figure 3.

Table 2: Comparison of awareness with qualification

Designation	Awareness			Total	Chi
	Low	Moderate	High		
Graduates	60%	30.7%	9.3%	182	0.025
PG trainees	45%	46%	9%	141	
Consultants	40%	49%	11%	57	

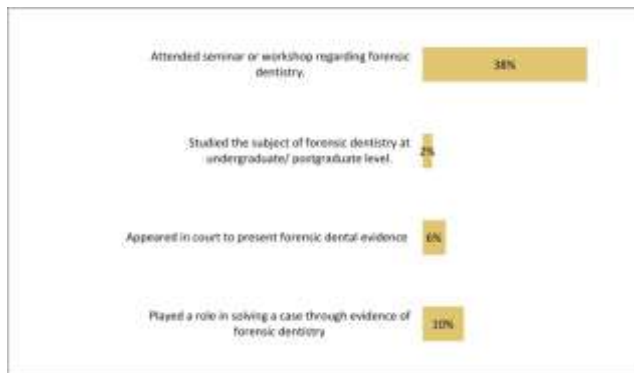


Figure 1: Exposure to forensic odontology



Figure 2: Recommendation for forensic dentistry as a postgraduate program

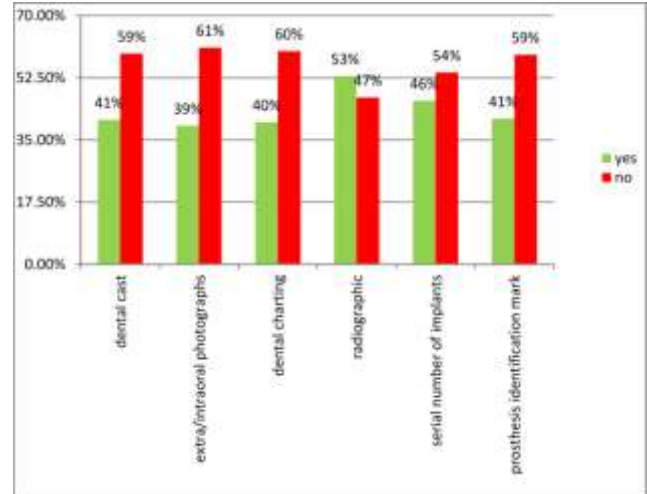


Figure 3: Record keeping practices among participants

DISCUSSION

The dental practitioners have the primary responsibility to provide ante-mortem data in the form of dental records. They can be used to confirm identity and can assist forensic odontologists in the process of dental identification. It is the ethical, legal and professional obligation of dental practitioners to maintain dental records. They not only ensure the quality of care but also serve as antemortem evidence for forensic odontologists^{5,10}. The legibility and accuracy of these records can improve their authenticity for dental evidence. One of the biggest challenges faced by forensic odontologists is deficient or poor quality dental records which delay the process of identification¹⁵. Our study adds to the evidence that there is limited awareness regarding FO among dental practitioners in Pakistan. This can be attributed to the fact that there is a lack of exposure to the subject of FO at the undergraduate or post-graduate level. Only 2% of respondents studied the subject of FO at the undergraduate or post-graduate level. This has also been highlighted by previous studies in Pakistan in which participants agreed that there was no formal FO department or that they were not aware of it^{13,16}. Similarly in another study conducted among Pakistani dental practitioners, 84.8% of respondents agreed that they have inadequate knowledge regarding FO¹⁷. The science of FO has earned great significance across developed countries however, in developing countries like Pakistan, it is yet to be fully developed. This may reflect the lack of establishment of FO as a distinct and independent discipline in the dental curriculum of Pakistan. Because of limited awareness and experience in this field, there is a lack of involvement among dentists in forensic investigation and procedures. For instance, a study conducted in Pakistan observed that only 54% of dental practitioners were aware of the fact that they were legally qualified to present forensic dental evidence in court. In addition, 92% of dental practitioners were unable to acknowledge presence of any forensic odontologist in Pakistan¹². This can explain our finding that a very limited number of participants in our study had the experience of presenting dental evidence in the court. Despite limited exposure to the field of FO, the participants' knowledge regarding the forensic importance of dental tissues was found to be adequate as shown in table 3. For example, more than 70% of the participants were aware that natural teeth can serve as a source of DNA and enamel/dentin can act as an aid for estimation of age. Similarly, 69% of the participants knew that bite mark patterns can be an important aide for assessing criminal assault cases. Reasons for this could include recent media coverage on the forensic subject area especially highlighting the role of FO in the identification of victims of the Pakistan International Airline (PIA) plane crash¹⁸.

Another important aspect of this study was to explore the correlation between the level of awareness and the designation of participants. It was found that the awareness level of the consultants and specialists was better as compared to undergraduates and postgraduate residents. This was also correlated to the age and experience of the respondents with older age group having more awareness than younger ones. The difference can be explained by the fact that consultants have more clinical exposure to these types of cases and more opportunities for continued medical education in this field. Greater awareness was reported among the males as compared to the females. This can be attributed to greater number of male dentists practicing in Pakistan.

The participants were also asked if they wanted to implement training in the subject of forensic dentistry. An overwhelming response of 96.6% was recorded for participants agreeing to recommend FO as an independent postgraduate subject. This is consistent with a previous study in which 98 % of the faculty members and 86 % of students stated that formal teaching of the subject should be implemented¹⁶.

Table 3: Knowledge regarding forensic importance of dental tissues

Knowledge	Frequency	%age
Natural teeth can serve as a source of DNA.	298	76.3%
Enamel/dentin can act as an aid for estimation of age.	273	71%
Lip print patterns of humans can be used for identification of an individual.	186	49%
Bite mark pattern of human teeth can be an important adjunct for assessing criminal assaults.	261	69%

Table 4: Perceived barriers to record-keeping practice

Perceived barrier	Frequency	Percentage
Lack of digital access	147	38.7%
Lack of time	85	22.7%
Lack of record quality check personnel	135	35.5%
Lack of storage space	73	19.2%
Increased workload	156	44.6%

Table 5: Comparison of perceived barriers with awareness level

Perceived barrier	Awareness			Total
	Low	Moderate	High	
Lack of digital access	78	58	11	147
Lack of time	44	36	5	85
Lack of record quality check personnel	70	49	16	135
Lack of storage space	37	29	7	73
Increased workload	81	60	15	156

A major aspect of FO as a speciality is the forensic value of dental records maintained by dental practitioners. The accuracy, accessibility and legibility of dental record keeping are important indicators that justify their use as dental evidence. For this reason, developed countries like UK, USA, Canada have legislative authorities that provide guidelines to regulate dental record keeping¹⁹. In Pakistan, there seems to be a lack of dental record management among dental practitioners¹⁶. A study revealed that 52.4% of the participants agreed that they were not taught dental record management as part of their curriculum¹². In our study, self-reported record-keeping practices among the participants were also assessed. It was revealed that 59% of dentists did not retain the dental records of their patients. To some extent, this can be attributed to the lack of time and increased workload in busy clinical practices⁵. When inquired about potential barriers that keep dental practitioners from maintaining accurate and complete dental records, the majority of them reported lack of digital access and increased workload as leading factors (Table 4 & 5).

On one hand, the development of modern electronic patient files systems and digital radiographs have made possible an efficient way for long term and retrievable record keeping²⁰. However, this comes with its shortcomings such as high

maintenance cost and requirement of technical skills. This might contribute as one of the major reason that only half of the study participants retain their patients radiographs and photographs. In addition to this, a lack of awareness about the forensic value of dental documents among dental practitioners might also be the reason for incomplete and inaccurate record maintenance^{15,21}.

Radiographs were reported to be the most retained dental record as 53% of dentists reported that they retain their patient's radiographs. This is because radiographs form an important diagnostic aide in clinical practice and also serve as a baseline reference for future follow-ups. Good quality radiographs are an important part of forensic evidence as they play a major role in age estimation and identification of individuals¹⁰. Intra and extraoral photographs were maintained by only 39% of the participants. Studies have published that students are more likely to record and maintain before and after photographs of their patients as compared to dental practitioners¹⁰. This may be attributed to the purpose of evaluation and assessment of their performance by their supervisors.

Limitations: There were some limitations of this study that should be accounted for. A large population of the respondents belonged to graduates and post-graduate residents with a fewer number of consultants. This limitation is ascribed to a lack of response rate from consultants.

CONCLUSIONS

Accurate and retrievable dental records are not only beneficial for the dental practitioner himself for future follow-ups but can also help and facilitate legal authorities in efficiently solving forensic cases. A limited number of practitioners in our study reported to be consistent with this practice. Hence there is a need to implement strategies to raise awareness regarding the forensic value of dental records and their importance in forensic investigation. The study aimed to highlight the current awareness regarding FO in Pakistan. In the light of our results it can be suggested that dental institutes should devise and incorporate FO in to the undergraduate curriculum. Moreover, guidelines should be established and minimum standards should be set for teaching the subject at various levels. Also measures should be taken to educate students and dental practitioners about various aspects of FO through various CPD activities.

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