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Forensic Dentistry In Dire Need Of Recognition As A Separate Entity In Pakistan: A Cross-Sectional Study

Syeda Sadia Zafar[1]*, Saba Hassan Shamim[2], Mahrukh Sheikh[1], Lubna Avesi[2], Farheen Danish[2] and Quarat ul Ain[3]

[1]*Department of Oral Pathology, Dr. Ishrat-Ul-Ebad Institute of Oral Health Sciences, Dow University of Health Sciences, Ojha Campus, Karachi-Pakistan.*
[2] *Department of Histopathology, Dow International Medical College, Dow University of Health Sciences, Ojha Campus, Karachi-Pakistan*
[3] *Department of Orthodontics, Altamash Institute of Dental Medicine, Karachi-Pakistan Pakistan*

Abstract: Introduction: In this period of advancement, forensic dentistry plays crucial role in recognition of a person for ethical and the legal proceedings through the analysis of orofacial and dental characteristics with previous records. In this study, we aimed to assess the interest of dental professionals in participating in forensic dentistry courses and their willingness to introduce this subspecialty in the course curriculum of post graduate studies and to assess the knowledge, attitude and awareness about forensic odontology among dental professionals of Karachi, Pakistan. **Methodology**: This cross-sectional study was conducted through an online self-administered Knowledge, Attitude, and Practices (KAP) questionnaire with multiple close-end questions. In a convenient sample of 277 participants that includes academic faculty, undergraduates, postgraduates, house officers, dental care professional students (DCP) and dental technician/hygienist from Karachi, Pakistan. Data was measured using IBM SPSS version 26.0. **Results:** The survey showed that a significant number of study participants have knowledge of forensic dentistry as a branch 70.02% (p value 0.000) of the respondents showed interest to integrate forensic dentistry in the core curriculum. 62% of the Participants showed willingness to opt forensic dentistry as a career or profession. Those who were unwilling had various reasons. A significant number of people maintain dental records (P value = 0.026). **Conclusion**: There is need for up gradation and recognition of forensic dentistry into the curricula of dentistry to meet the international trends and pursue it as career.

Keywords: Dentistry, Forensic, KAP survey, Odontology, Subject, Pakistan

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***Correspondence:** Department of Oral Pathology, Dr. Ishrat-Ul-Ebad Institute of Oral Health Sciences, Dow University of Health Sciences, Ojha Campus, Karachi-Pakistan, Tel: 0092- 347 2040471 Email: sadia.zafar@dikiohs.duhs.edu.pk

Introduction

The tooth is the hardest tissue and almost unique to every individual found in the living body . The chief component of the tooth's structure is hydroxyapatite crystals, an inorganic material which provides the tooth, the capability to withstand temperature variations and resist decomposition, destruction and detoriation [1]. The tooth structure remains undamaged for a long period of time, making it the last part of the body to be detonated after an individual's death. In addition to this, it can also be a source for extraction of genetic (DNA) material. Dental records can serve as a major tool in the accurate identification of an individual's identity, especially in event of mass catastrophe and can aid in solving age and property disputes. They are found to be

less technique sensitive and cost effective as compared to traditional methods such as DNA fingerprints [2]. Forensic odontology is the sub special presentation of the dental sciences that is also known as forensic dentistry as designated by the Federation Dentaire International (FDI). It primarily involves the management and inspection of dental proof and the proper assessment and preservation of dental records [3]. This fascinating branch of dental sciences uses specifically orofacial and dental physiognomies for civil proceedings (mass disasters like earthquakes, airplane, train and motor vehicle accidents, bomb blasts, tsunamis) and can be used for judicial measures (for settlement domains, age estimation), criminal investigations (child abuse, sexual assaults, murders, domestic violence), and also for scientific research purposes[4]. The evaluation and comparison of an individual's postmortem findings (PM) and ante mortem (AM) records can help in identification of the deceased [5]. A dental record includes patient' demographic details, dental treatment histories, clinical findings (extracted tooth, fillings, root canal procedures, dental prosthesis), dental radiographs, patient' casts, impressions and photographs. By application of forensic odontology, the trained forensic odontologist can estimate the person's age, race, gender, occupation, There can also be use of techniques such as bite mark analysis, lip prints analysis, palatal prints analysis, dental photographs, dental radiographs, and dental fillings and prosthesis [1, 2, 5].The history of forensic odontology dates back to 66 AD, when the first well documented case of identification of a person with the help of dental records was the Lollia Pauline and Agrippina case[2]. In Pakistan, the first case of identification of a deceased body via their dental records is of former President of Pakistan Gen. Zia ul Haq in 1988[6]. A few other cases where forensic odontology was of significance include age estimation of Abdullah Jatoi in 2013 by dental records[7], identification of dead bodies of famous Junaid Jamshed and PIA plane crash victims in 2016 through dental records[6, 8] and till date last reported case of forensic odontology in Pakistan is the identification of the victims of the air crash accident of PK 8303[9].In Pakistan, this empowering field of forensic odontology is enlisted only as a topic in the curriculum of Bachelor of Dental Surgery (BDS) under the subject of Oral & Maxillofacial Surgery and also as a topic with few lectures in the curriculum of Masters of Dental Sciences / Surgery (MDS)[10]. Although in recent times of advancement and development, forensic odontology has been acclaimed worldwide as necessary and interesting field. Unfortunately, Pakistan only has few certified and trained forensic odontologists [9] halting the process of further progress and education in the field. It is still not recognized as separate discipline or a sub specialty to be pursued after graduation. The integration of forensic odontology as an academic field and a tool in postmortem identification of a person with determination of possible cause is a long and time-consuming process necessitating the need to evaluate and increase awareness regarding the field among dental faculty and students. The main objective of this study is to highlight the significance of forensic odontology and to assess the willingness of dental professionals to pursue forensic odontology as a specialty after graduation.

Materials & Methods

The study design is cross sectional, descriptive and was conducted from January 2022 to July 2022 using a self-administered structured questionnaire constructed on Google forms with multiple close ended questions with multiple choice options. It was conducted among 277 participants, which were selected through random convenience sampling technique. The questionnaire was online, sent via email and whatsapp accounts. All the surveyed individuals were from Karachi Pakistan. Completion and submission of forms was considered as consent from participants. The participants were divided into groups on the basis of their present credentials. One group is of academic faculty and another group is of undergraduate and post graduate students and the last group is of dental technician and hygienist. Inclusion criteria of the participants included individuals associated with dental field having basic knowledge of forensic

odontology. An exclusion criterion includes Non-Dental professionals and incomplete forms were excluded. The study was conducted via online survey so the approval of ethical committee was not taken at this level.

The 1st part of the questionnaire was about the demographic details of the participants which comprises of gender, present credentials and professional designation while the 2nd part was about the knowledge, attitude and practices in regard of forensic dentistry. The gathered data was analyzed by using Statistical Package for the Social Sciences (SPSS) version 26.0. Data was measured using frequencies and percentages.

Results

A total of 277 dental professionals took participation in this study and major part of the participation was from the females. Demographic details are shown in the figure 1.

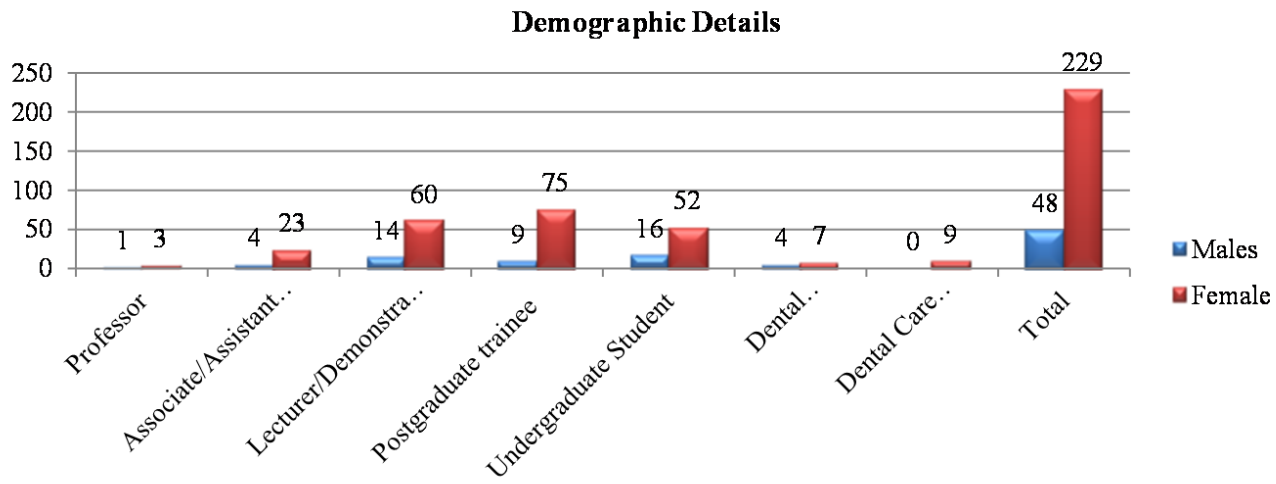

Figure 1: Demographic details of participants

The participants had significant knowledge regarding forensic odontology as a branch of dentistry and the use of teeth as a source of DNA, (p-value 0.000 & 0.025). The results regarding the importance of bite mark pattern and the identification of deceased individuals using dental records were found to be insignificant (p-value 0.144 & 0.851).

Table 1: Knowledge of participants in context of forensic odontology

S.No		Gender	Yes	No	Don't Know	P-value (gender)	P-value (profession)
1.	Forensic dentistry as a branch	Male	40	8			0.000
		Female	184	45			
2.	Forensic dentistry is helpful in identifying criminals/individual	Male	44	2	2	0.008	0.851
		Female	219	0	10		
3.	Could teeth be a source of DNA	Male	38	5	5	0.008	0.025
		Female	203	4	22		
4.	Significance of bite mark pattern	Male	31	17			0.144
		Female	132	97			

When questioned about the method of assessment of age through dental records, 255 (92.0%) of the respondents chose the option of eruption pattern and calcification of teeth while 9(0.03%) were in favor of histological and biochemical method and 13 (0.06%) were not aware.

Table 2: Response of participants regarding identification of age.

	Eruption Pattern & Calcification	**Histological Method**	**Biochemical Methods**	**Don't Know**	**Total**
Professor	4	0	0	0	4
Associate/Assistant Professor	27	0	0	0	27
Lec/Demo/House Officer	70	2	0	2	74
Postgraduate	77	2	2	3	84
Undergraduate	63	1	1	3	68
Technician/Hygienist	6	1	0	4	11
DCP Student	8	0	0	1	9
Total	255	6	3	13	277

In response to question for the identification of mass disaster victim's age and the gender, 208 (75%) of the individuals said that they identify the body by dental and jaw bone records 69 (25%) were of the opinion of reconstruction of the fragmented deceased body/ body parts as summarized in table 3.

Table 3: Response of Identification of Age

	Reconstruct the fragmented deceased body	**Dental jaw & Bone records**	**Finger Prints**	**Don't Know**	**Total**
Professor	1	3	0	0	4
Associate/Assistant Professor	0	27	0	0	27
Lec/Demo/HO	1	59	4	10	74
Postgraduate	3	71	6	4	84
Undergraduate	4	50	6	8	68
Technician/Hygienist	0	8	0	3	11
DCP Student	0	6	1	2	9
	9	224	17	27	277

In terms of willingness of dental professionals for participation of seminars regarding this field, 243 (87.7%) of the participants showed a positive attitude while 34 (12.3%) were not interested.
In response to opting forensic dentistry as a profession, 172 (62%) participants agreed to take it as a career choice while 56 (20.2%) did not agree,,(out of which 28% didn't like it, 4% did not want to be a witness in the court, 38% didn't want to affair in legal matters, 21% didn't consider that forensic dentistry has any future potential, 9% said that they will not be paid enough in this field) 49 (17.8%) were not sure to take this field as a profession.
When questioned about the integration of forensic odontology in the academic curriculum or a sub specialty 194 (70.2%) 70.4% of the correspondents were willing to take it as independent subject or as a sub specialty and it should be taught in curriculum of dentistry, although 21 (7.5%) were not in favor and 62 (22.3%) were not sure. Regarding dental record keeping, a significant p value i-e 0.026 was obtained.

Table 4: Practice of participants in context of forensic odontology

	Questions		**Male**	**Female**	**P-value**
1.	Do you keep a documentation of records of dental patients in your clinic?	Yes	32	119	0.026
		No	4	47	
		Not Always	12	63	
2.	Do you think your awareness & knowledge of Forensic odontology is enough?	Yes	9	10	0.050
		No	36	213	

		Don't Know	3	6	
3.	Do you have any formal training related to this field?	Yes	5	7	0.013
		No	43	222	
4.	Do you have this subject as part of your curriculum or course outline?	Yes	8	43	0.003
		No	40	186	

Discussion

The goal of the study was to check the level of knowledge of dental professional and faculty regarding forensic odontology and their attitude towards recognition of this field as a separate subject or subspecialty. In this regard the knowledge of participants was satisfactory as more than 80% of the study population was aware of the possible methods of age assessment through dental records. Significant knowledge was also present regarding the fact that tooth could serve as an excellent source of the genomic DNA. Most of the dental personals had an inclination to pursue forensic odontology as a career choice. A positive result was found regarding the inclusion of this subject in the curriculum and participation in relevant seminars.

Despite of the negligible training and education, the high profile personalities of Pakistan which were Ex-President Gen. Zia ul Haq and Mr. Junaid Jamshed were identified through the dental evidences and records [6, 8] and one legal and judicial case also solved through the dental record[7].

The participants agreed that their knowledge regarding forensic dentistry was insufficient which is in line with the results reported by a survey conducted in Saudi Arabia with same sample distribution as our study.[11] The results of the survey regarding use of tooth structure as a source of DNA were found to be in line with the study conducted by S Akram et al in Karachi which also showed almost similar results [11, 12]. When inquired about the use of forensic dentistry for identification of criminals, knowledge was found to be insufficient with majority of the participants failing to identify bite mark as an important element for recognition purposes[12]. The results are also similar to a study conducted in India by Rathod et al in which dentists were not aware about recognition of people using bite mark pattern [13] and the study of S Akram et al.

Forensic odontology can serve as an aid in the recognition of a corpse's gender and his/her age therefore playing a key role in Disaster Victim Identification (DVI) and criminal proceedings as reported by Alex forresst [14]. Most of the individuals had significant awareness about the use of dental records for estimation of age of victims in a mass castastrophe in similarity to results reported by a survey held in a frequently disaster hit country Indonesia DK Isher at el in his study quoted that dental practitioners can be linked with identification of the suspect and the deceased, are usually required in judiciary to provide evidences in the capacity of an expert witness[15]. This is a requirement in other legal systems as well worldwide.[16] The results of our study were found to be contradictory to this fact as participants were not aware that they might be called in court of law to present forensic substantiates.

A substantial number of participants showed a keen interest to opt forensic dentistry as an occupation or employment; the individuals who did not agree were not willing to testify in court or did not see much potential. The results are in accordance with a study conducted among teachers of this subject in several countries where they encountered problems such as lack of recognition of the field and less hands on experience.[14]

Several studies report that dentists do not follow a strict protocol when it comes to dental record keeping which can be of use for forensic odontologist[17-19]. Our study also indicates that the dentists are well aware of importance of dental records but there is a need to maintain them with more precision and detail.

Some researchers like Acharya AB et al, Ali A et al and NS Abdul et al have highlighted the significance of forensic odontology to be included in to the dental curriculum[11, 20, 21]. The

participants of the study showed interest to add forensic in the curriculum program to get more exposure and training for the assessment of mass catastrophic situations, in cases of assassination, doubted cases of abuse, criminal violence, and civil counterclaim. The detailed and formal teaching of forensics at undergraduate level helps the graduates to support and assist the forensic odontologist in medico-legal cases by providing dental documents and identifying the individual via dental implications. It also helps the professionals to attain satisfactory skills and experience and provide guidance to choose it as an occupation.

S Pandit et al concluded in his study that it is very necessary to educate and train the investigatory team of police about the forensic odontology for the assessment and analysis of disastrous and criminal circumstances[22]. In light of the significance of the matter it seems necessary to produce specialists in this field to deal with trajectories along with training of police personnel to collect the dental evidences with the proper documentation, packaging, labeling & transference of the evidences to the respective departments with proper protocols and all[22].

Conclusion

This survey based study discloses that most of the dental professionals are familiar with the forensic odontology but there knowledge is deficient regarding forensic dentistry. High number of participants showed positive attitude to avail the opportunity of postgraduate programs in forensic dentistry if offered. Majority agree to choose this empowering field as a career prospective.

In Pakistan there is lack of the scientifically trained forensic odontologist, after introducing this subject into the post graduate curriculum and formal training, there is an expectation that substantial progress and development will be seen in the standing of forensic odontology in Pakistan.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

None.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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