



## KNOWLEDGE OF FORENSIC ODONTOLOGY AMONG DIFFERENT GENERAL HEALTH AND DENTAL PROFESSIONALS AS NEWLY EMERGING FIELD: A CROSS- SECTIONAL STUDY

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### ABSTRACT

In this study, dental practitioners in Pakistan were asked about their knowledge and familiarity with FO. Another goal was to create resources to provide basic information about FO and highlight the significance of dental records. The ethical committee authorized the investigation's approach (#09208-22-2023). There was a cross-sectional investigation. The study population included all dental and general health professionals working in various settings such as Ayub Medical College, Abbottabad, Pakistan, and Lahore Medical & Dental College, Lahore, Pakistan, including dental faculty members of different dental specialties. The analysis of the data was done with SPSS 26. The p-value of less than 0.05 was found to be statistically significant. There were 55.7% participants were dental professionals following 44.3% participants were general health professionals. 40% were residents, 37.3% were academic specialists, and 22.7% were consultants. Almost 8.1% of the respondents were having poor knowledge about forensic odontology. Yet,

89.7% of all respondents had no information received about this branch. Most of the respondents reported that only 31.9% doctors knew that they can use dentistry as evidence with significant p-value of 0.000 while 61.6% does not focus on this point. As per study approach, 74.50% dental professionals and 44.60% general health professionals have thought that if forensic odontology would emerge as other professions then it will increase the clinical significance while 17.30% dental professionals and 22.40% general health professionals have thought that it will enhance the efficiency of investigation process. It is concluded that according to the latest research, general health practitioners are less knowledgeable than dentistry professionals. Nevertheless, this situation can be improved by adding forensic odontology to Pakistan's forensic science and dental science curricula. Dental practitioners must keep oral records since they are also helpful from a medico-legal perspective. General health and dentistry professionals must constantly update their understanding of forensic odontology.

**Keywords:** Knowledge, forensic science, forensic odontology, general health and dental professionals

## INTRODUCTION

Forensic dentistry, also called forensic odontology, is the branch of dentistry that deals with legal matters [1, 2]. One area of dentistry specialization that deals with legal issues is forensic odontology. It is one of the areas of forensic science and medicine growing fastest [3]. The field of dentistry, known as forensic odontology, is concerned with the appropriate management, examination, and presentation of dental discoveries in the service of justice. Forensic identity determination in natural and artificial disasters has been the primary use of this relatively new field within the forensic sciences for many years [4]. One of the earlier studies highlighted the dentist's role in diagnosing child abuse [5-7]. In forensic dentistry (FD), dentists play a minor but essential role in criminal investigation. Forensic dentistry is a subspecialty of forensic medicine that deals with preserving, analyzing, assessing, and presenting dental evidence from a deceased person—even after the body has undergone some degree of disintegration or damage—to advance the cause of justice For investigators in situations when evidence is absent, such as fingerprints or noticeable injuries, FD can be pretty useful [8]. Forensic odontology has become an integral part of forensic medicine over the past 100 years [9]. It may also be sub-classified into forensic-odonto-toxicology, which deals with cases of poisoning, but this field is yet to gain popularity globally [10]. Forensic odontology plays an important role in criminal, monetary disputes, marital, social, burial, and the identification of individuals missing for prolonged periods [11]. Identification plays an important role in civil cases like insurance claims, matrimonial disputes, property disputes, impersonation, and issue of passports and various licenses [12]. A general dentist apart from having a broad background knowledge of general dentistry, should also possess basic knowledge of the role of the forensic pathologist, methods used in autopsy, the role of a dentist in the identification of a person, and the importance of maintaining dental records of all patients [13].

Legal cases involving dental fraud and malpractice, bite mark analysis, age prediction, and—most importantly—human identity are among the fields covered by forensic orthodontia (FO). Interpol lists teeth as one of the primary identifiers because they resist many factors, including high temperatures, immersion, and decomposition. Additionally, compared to DNA and fingerprinting, teeth are the most affordable, fastest, and straightforward means of identifying a person [14]. FO is still very new and has little acceptance in Pakistan as a subject of study and a profession. There is only "one" dentist registered with the Asia-Pacific Forensic Odontologist (APFO) organization as a forensic orthodontist in a nation of 207.774 million people and 2,040 dentists registered as specialists in 2018 [15]. More specialists in the industry need to be educated and trained, as Pakistan is a developing nation prone to natural calamities. Pakistan's experience with FO has been restricted to a small number of age estimation and person identification cases, even though several Asian nations are working on developments in this subject and have their own DVI units,

including forensic odontologists. The country has not taken any additional steps in this field, practically or academically, except in those cases. Unfortunately, forensic odontologists with the necessary training are rare in Pakistan [16–18]. The lack of appropriate understanding likely to be blamed since neither the public nor the government fully comprehends the potential role forensic odontologists can play [19–22]. Therefore, it is important for Pakistani health and dental practitioners to know the value of dental records and to acquire thorough methods for capturing, keeping, and updating teeth data. In this study, dental practitioners in Pakistan were asked about their knowledge and familiarity with FO. Another goal was to create resources to provide basic information about FO and highlight the significance of dental records.

## RESEARCH METHODS

The ethical committee authorized the investigation's methods (#09208-22-2023). There was a cross-sectional investigation. The study population included all dental health professionals working in various settings such as Ayub Medical College, Abbottabad, Pakistan, and Lahore Medical & Dental College, Lahore, Pakistan, including dental faculty members of different dental specialties. The health professionals included pharmacologists, pathologists, and general forensic scientists. Based on the sample calculations, 185 persons were included, and each participant completed the questionnaire. Participants did not include dental students, general health students, or technicians. The research questions came from an earlier investigation [21]. Using email and Whatsapp, a pre-validated English questionnaire was disseminated online. Confidentiality was to be maintained, and legal experts were asked to engage in the study willingly. Before responding to the questionnaire, participants were required to give their informed consent. Professionals received the study's goals, objectives, and specifics. They knew the possible advantages of education for professionals, students, and the community.

Five working consultants were given access to the final draft of the questionnaire's pilot tests. Through piloting, the questionnaire's acceptance and reliability were evaluated, its administration duration was estimated, and the viability of performing the research project among our community was evaluated [22]. We used Google Forms as a research tool. The questionnaire included questions on demographics, evaluated knowledge and attitudes about forensic odontology and its relationship, and covered topics related to retaining dental records. The inquiries were structured as multiple-choice questions with a closed-ended nature. The analysis of the data was done with SPSS 26. The percentage was computed to do the descriptive analysis. Descriptive statistical methods were used to determine statistical significance. Pearson chi-square was used in bivariate analysis to show the results across different exposures. A p-value of less than 0.05 was found to be statistically significant.

## RESULTS AND DISCUSSION

Table 1 demonstrated the demographic characteristics of study population. There were total 185 participants. Among them, 69.1% females and 30.9% were males. In overall, 82.1% populations were working in public setting and only 17.9% were working in private setting. Data were collected from both community pharmacists and obstetrician & gynecologists. There were 55.7% participants were dental professionals following 44.3% participants were general health professionals. 40% were residents, 37.3% were academic specialists, and 22.7% were consultants. Moreover, 74.6% were having professional experience of 6-10 years and only 7.0% were having <5 years of professional experience. Almost 8.1% of the respondents were having poor knowledge about forensic odontology. Yet, 89.7% of all respondents had no information received about this branch (Table 1). Table 2 demonstrated that assessment of knowledge of study participants regarding forensic odontology. Most of the respondents reported that only 31.9% doctors knew that they can use dentistry as evidence with significant p-value of 0.000 while 61.6% does not focus on this point. More details have given below in Table 2. Figure 1 discussed the importance of implementation of forensic odontology as newly emerging field. As per study approach, 74.50% dental professionals

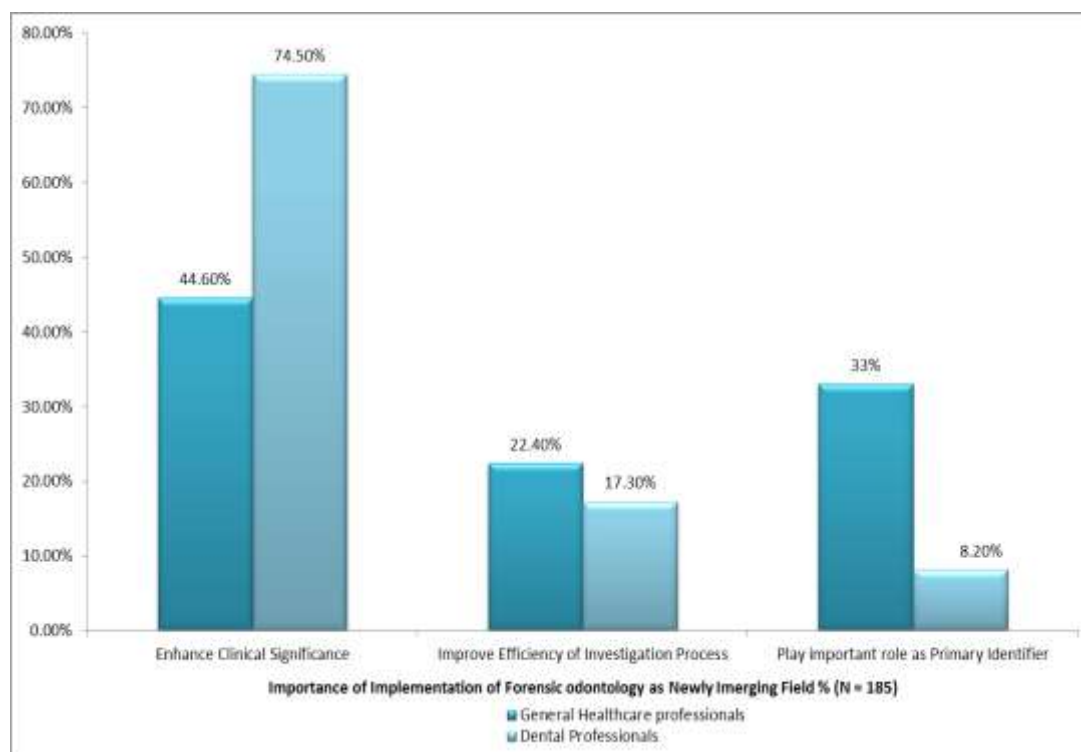
and 44.60% general health professionals have thought that if forensic odontology would emerge as other professions then it will increase the clinical significance while 17.30% dental professionals and 22.40% general health professionals have thought that it will enhance the efficiency of investigation process. More details have given below in Figure 1.

**Table 1: Demographic Characteristics of study population (N = 185)**

<b>Variables</b>	<b>Frequency</b>	<b>%age</b>
<b>Gender</b>		
Female	128	69.1
Male	57	30.9
<b>Working Sector</b>		
Private setting	33	17.9
Public setting	152	82.1
<b>Participants</b>		
General Health Professionals	82	44.3
Dental Professionals	103	55.7
<b>Career Position</b>		
Consultant	42	22.7
Academic specialists	69	37.3
Residents	74	40.0
<b>Professional Experience (Years)</b>		
<5	13	7.0
6-10	138	74.6
>11	34	18.4
<b>Knowledge about forensic odontology</b>		
Poor	15	8.1
Good	4	2.2
Don't Know	166	89.7

**Table 2: Assessment of Knowledge of study participants regarding forensic odontology**

<b>Variables</b>	<b>Overall response Frequency (%)</b>	<b>P-value</b>
<b>Do doctors know they can give forensic dental evidence in court by testifying as a qualified experience?</b>		
Yes	59 (31.9)	0.000
No	12 (6.5)	
Don't Know	114 (61.6)	
<b>Do you think forensic odontology is a sensitive and accurate way to identify individuals who aren't known to you?</b>		
Yes	13 (7.0)	0.001
No	34 (18.4)	
Don't Know	138 (74.6)	
<b>Are you interested to join forensic odontology as a profession?</b>		
Yes	82 (44.3)	0.000
No	03 (1.6)	
Don't Know	100 (54.1)	
<b>Are you aware of the significance of maintaining dental records in identifying the deceased and crime suspects?</b>		
Yes	25 (13.5)	0.002
No	160 (86.5)	
<b>Forensic odontology will help to identify human remains that cannot be identified using face recognition, fingerprints or other means</b>		
Disagree	13 (7.1)	0.001
Agree	172 (92.9)	
<b>Forensic odontology should be well recognized as other professions.</b>		
Disagree	08 (4.4)	0.004
Agree	177 (95.6)	



Forensic odontology is a fascinating area of forensic science that includes using dental information to identify a person, whether they are living or deceased. The present study was underway to close this knowledge gap in the field of forensic odontology in Pakistan because there is a dearth of verified data in this area. This one was one of the first studies conducted in Pakistan to assess general health and dentistry professionals' knowledge and awareness. The current study provides insight into practitioners' thoughts on forensic odontology documentation and its current position. While some prior research indicated that graduates and postgraduates understood bite marks, many private dental practitioners were unaware of the markings' importance [23–25]. According to similar published statistics, almost 70% of participants knew what lip prints were [26]. Similar to earlier research, practically 90.4% of our survey respondents never receiving any formal FD instruction [27]. In the literature, more studies demonstrate dentists' ignorance of FD than their acquisition of adequate understanding [28–30]. Twenty percent of respondents in a prior cross-sectional research of seventy dental practitioners in India did not preserve dental records in their clinical setup, whereas seventy-seven percent did. The questionnaire was based on Knowledge, Attitude, and Practice. The official dental chronicles must be updated to be immune from any medicolegal litigation. According to the results of the current study, over 85% of participants understood how important it was to maintain the dental record. It was consistent with other research by Al Khalaf et al. and Ali et al., which found that 87% and 88.5% of the participants, respectively, kept dental records [31]. All the factors show a statistically significant difference in this case. The dental study cast is ranked lowest on the list of FD record types, indicating that all respondents thought it was the least helpful record. Furthermore, the majority of respondents think dental records ought to be connected to medical and personal profiles. In dentistry, keeping records is important not just for forensic purposes but also for future reference by practitioners if necessary. In a consumer court, the dental record may be used as evidence. Additionally, this greatly aids patients in filing dental insurance claims. Social media's extensive reach has made everyone aware of their legal rights and concerns. Therefore, general health and dentistry specialists should possess a deep understanding of dental records. All of this is feasible if the curriculum includes forensic odontology. Nonetheless, there are some reservations about forensic odontology being taught in curricula. It is necessary to develop a procedure for the ongoing observation of dental professionals to improve their expertise in forensic odontology. There aren't

any workshops or ongoing dental education initiatives in Pakistan. To educate oral health care providers about forensic odontology in society, it is imperative that forensic odontology be included in formal training programs. Because the participants in this study are restricted to a single geographic location, a multicentric study involving clinicians from several geographic areas must be conducted before the results are applied generally.

## CONCLUSION

It is concluded that according to the latest research, general health practitioners are less knowledgeable than dentistry professionals. Nevertheless, this situation can be improved by adding forensic odontology to Pakistan's forensic science and dental science curricula. Dental practitioners must keep oral records since they are also helpful from a medico-legal perspective. General health and dentistry professionals must constantly update their understanding of forensic odontology.

## REFERENCES

1. Al Khalaf, A. H., Al Nahawi, D. E., Al Naser, H. H., & Nazir, M. A. (2017). The knowledge and practice of forensic dentistry among dental practitioners in the Eastern Province, Saudi Arabia. *Int J Adv Res*, 5, 1971-8.
2. Alsowayigh, K., Almajaishe, R., Alateeq, H., Alaskar, N., Alamoudi, A., & Alzahrani, K. (2021). Forensic Odontology Knowledge Analysis among Undergraduates Dental Students in Saudi Arabia.
3. Alshaqaaq, M., Albekairi, M., Almakhlafi, L., Alessa, A., Aldhafyan, H., Almohammedsaleh, H., & Ansari, S. H. (2018). Knowledge and Awareness of Forensic Odontology among the Dental Practitioners in Riyadh City: A Survey-Based Study. *Donnish Journal of Dentistry and Oral Hygiene*, 4(2), 54-62.
4. Nazir, M. A., Al-Ansari, A., Al-Khalifa, K., & Gaffar, B. O. (2019). Determinants of knowledge and practice of forensic dentistry amongst dental practitioners. *European Journal of Dental Education*, 23(4), 491-497.
5. Duraimurugan, S., Gokkulakrishnan, S., Karthikeyan, M., Suresh, K. G., Abishek, R. B., & Srinivasalu, P. (2017). Awareness of forensic dentistry among dental students and practitioners in and around Kanchipuram district. *Int J Recent Sci Res*, 8, 16749-52.
6. Ali, A., Sardar, K. P., Nasir, S., & Wakar, S. M. (2016). Knowledge, attitude and practice of forensic odontology among graduates and post graduate students at Dow University of Health Sciences (DUHS). *JPDA*, 25(03), 111.
7. Abdul, N. S., Alhazani, L., Alruwail, R., Aldres, S., & Asil, S. (2019). Awareness of forensic odontology among undergraduate, graduate, and postgraduate dental students in Riyadh, Saudi Arabia: A knowledge-, attitude-, and practice-based study. *Journal of forensic dental sciences*, 11(1), 35.
8. Almutairi, A. F., Alkhtheri, B. A., Aleidan, H. N., Alhabib, A. A., Alotaibi, E. A., & Salam, M. (2018). Examining the perceived versus the actual knowledge about forensic odontology: A cross-sectional survey among dentists. *Clinical and Experimental Dental Research*, 4(6), 297-304.
9. Sharma, A., Shokeen, S., Arora, R., & Dhaginakatti, S. A. (2015). Survey on knowledge, attitude and practice of forensic odontology among private dental practitioners in Ghaziabad city, India. *Journal of Dental Specialities*, 3(1).
10. Dr. Nabin Kumar Sinjali Magar, Dr. Dhruva Gaire & Dr. Prasanna Bahadur Amatya (2024). Evaluation of Pulmonary Hypertension in Chronic Obstructive Pulmonary Disease (COPD) by assessment of Chest X- Ray, ECG and Echocardiography. *Dinkum Journal of Medical Innovations*, 3(02):132-144.
11. Dr. Rosina Paudel, Dr. Dhan Keshar Khadka & Dr. Arpana Rijal (2024). Clinico-epidemiological Profile of Adult Acne and factors Associated with Adult Acne . *Dinkum Journal of Medical Innovations*, 3(02):145-164.

12. Dr. Sangam Pokharel, Dr. Rajesh Yadav, Dr. Anima Pradhan & Dr. Ashmita Paudel (2024). Comparative Study of Bupivacaine 0.5% and Ropivacaine 0.75% Epidurally In Lower Limb Orthopedic Surgeries. *Dinkum Journal of Medical Innovations*, 3(02):165-173.
13. Ms. Saroja Poudel & Dr. Rajesh Niraula (2024). Comprehensive study of Placenta Previa & Its Psychological Consequences. *Dinkum Journal of Medical Innovations*, 3(02):174-187.
14. Dr. Sujan Pradhan, Dr. Sabi Rana, Dr. Property Bhandari, Dr. Ozone Shrestha & Dr. Pranjal Shrestha (2024). The Correlation of Hearing Loss with Site & Size in Tympanic Membrane Perforation. *Dinkum Journal of Medical Innovations*, 3(02):188-198.
15. Zulfiqar, R., Khuwaja, I. G., Hussain, S. S., Bhuiyan, M. D. A., Shazu, S., Ijaz, H. S., ... & Judi, H. K. (2023). Artificial Intelligence As A Diagnostic Tool In Medicine And Community Dentistry: A Systematic Literature. *Artificial Intelligence*, 54(09).
16. Abdul Mumin, Abdullah Al Amin, A.K.M. Shahriar Kabir, Rifat Ara Noor & Urmi Rahman (2024). Role of C- Reactive Protein (CRP) and Neutrophil Lymphocyte Ratio (NLR) in detecting severity & Predicting outcome of Acute Pancreatitis patients. *Dinkum Journal of Medical Innovations*, 3(01):01-12.
17. Dr. Prabin Kumar Jha, Dr. Bindu Laxmi Shah, Dr. Shruti Kumari Thakur & Dr. Avinash Thakur (2024). Effectiveness of Dexamethasone as an Adjuvant to Bupivacaine in Supraclavicular Brachial Plexus Block. *Dinkum Journal of Medical Innovations*, 3(01):13-25.
18. Nahal Mostak Khan, Soheb Ahmed Robin, Lutfullahil Khabir & Sohel Mahmud (2024). Role of Vitamin C in Development of Age Related Cataract. *Dinkum Journal of Medical Innovations*, 3(01):26-34.
19. Nistha Thapa, Puja Gartaula & Pushpa Chand Thakuri (2024). Knowledge of hygienic food-handling Practices among street Food vendors in Dhading Besi, District Dhading, Nepal. *Dinkum Journal of Medical Innovations*, 3(01):35-51.
20. Al Sheddi, M., & Al Asiri, A. (2015). Awareness of the scope and practice of forensic dentistry among dental practitioners. *Australian Journal of Forensic Sciences*, 47(2), 194-199.
21. Berketa, J. W., James, H., & Lake, A. W. (2012). Forensic odontology involvement in disaster victim identification. *Forensic science, medicine, and pathology*, 8, 148-156.
22. Harchandani, N., Marathe, S., Hebbale, M., Ul Nisa, S., & Hiremutt, D. (2014). Awareness of forensic odontology among general dental practitioners in Pune-A cross-sectional study. *J Adv Med Dent Sci Res*, 2(3), 10-6.
23. Singh, K., Anandani, C., Bhullar, R. K., Agrawal, A., Chaudhary, H., & Thakral, A. (2012). Teeth and their secrets-Forensic dentistry. *J Forensic Res*, 3(1), 141.
24. Mazza, A., Merlati, G., Savio, C., Fassina, G., Menghini, P., & Danesino, P. (2005). Observations on dental structures when placed in contact with acids: Experimental studies to aid identification processes. *Journal of Forensic and Sciences*, 50(2), JFS2004292-5.
25. Navya, N., & Raj, J. D. (2016). To assess the knowledge and attitude toward forensic odontology among dentists in Chennai city. *International Journal of Forensic Odontology*, 1(1), 17.
26. Shivani, B., Arshroop, K., Karanprakash, S., Mahjeet, S. P., Navgeet, P., & Chitra, A. (2017). Perception of forensic odontology and its practice among local dentists of an institution. *J Forensic Res*, 8, 1-4.
27. Nagarajappa, R., Mehta, M., Shukla, N., Tuteja, J. S., & Bhalla, A. (2014). Awareness of forensic odontology among dental practitioners in Kanpur city, India: A KAP study. *J Dent Res Updates*, 1(1), 6-12.
28. Rahman, J., Routray, S., Mishra, S. S., Mohanty, I., Mohanty, N., & Sukla, N. (2017). Knowledge, awareness, and practice of forensic odontology among dental surgeons in Bhubaneswar, India. *Journal of Unexplored Medical Data* Volume, 2, 27.
29. AlBaker, A. M., Al-Ruthia, Y. S. H., AlShehri, M., & Alshuwairikh, S. (2017). The characteristics and distribution of dentist workforce in Saudi Arabia: a descriptive cross-sectional study. *Saudi pharmaceutical journal*, 25(8), 1208-1216.

30. Keiser-Nielsen, S. (1968). Forensic odontology. *International dental journal*, 18(3), 668-683.
31. Rontogianni, A., Mitsea, A., & Karayianni, K. (2023). Child Abuse and Neglect Screening: The Role of the Dental Team. *European Journal of Dental and Oral Health*, 4(1), 14-17.