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ORIGINAL STUDY

Awareness of Forensic Odontology among legal professionals in Delhi: A Survey based study

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Abstract

Background-: Forensic Odontology (FO) is an integral part of forensic medical sciences, which pacts with the appropriate handling, examination and demonstration of the dental evidence in the court of law.

The practical applicability of forensic odontology largely depends on its utilization by legal professionals. So, the aim of this study was to access and evaluate the level of awareness regarding various domains of FO among the legal professionals practicing in Delhi.

Methodology: A digital questionnaire in the form of google form consisting of a set of 13 questions was prepared and validated by a group of legal professionals. The responses were then cleared and & form was recirculated as a questionnaire- based survey among 280 legal professionals practicing in Delhi between the period of August and September 2025. The data was analyzed as per the sociodemographic details and the professional background related to the knowledge of forensic odontology and its applications pertaining to Indian laws and criminal cases. Statistical analysis was done using Chi square test as the test of significance.

Results-: Out of 280 study participants, males and females were 167 (59.6%) & 113(40.4%) respectively with varying levels of professional experience. The response rate was 100%. Chi- square analysis revealed a statistically significant association between higher professional experience (>10 years) and awareness of forensic odontology applications, including heard of term FO (χ^2 = 9.6, p= 0.002*); handled FO cases during the professional course (χ^2 = 5.81, p= 0.016*); age determination (χ^2 = 7.5, p= 0.023); gender determination (χ^2 = 6.7, p= 0.035*), bite mark analysis (χ^2 =12.7, p=0.001); DNA identification (χ^2 = 6.9, p= 0.031*) and tooth loss or fracture as grievous injury (χ^2 = 5.4, p = 0.020*).

Conclusion: From the current study, it is evident that practitioners with greater professional experience have better understanding of various domains of FO. Although dental evidence is considered very crucial and given considerable weightage in court, is rarely presented, depicting the lack of awareness regarding the practical utility of forensic odontology. Therefore, training through workshops and webinars should be conducted to strengthen the effectivity.

Keywords: Forensic odontology, legal professionals, questionnaire survey, criminal investigation

Introduction

The National Crime Records Bureau (NCRB) reported that India's most recent crime rate stands at 448.3 per 100,000 population.[1] Of the total registered crimes, Delhi accounts for approximately 5.2%, leading to its characterization as the "crime capital" among metropolitan cities, henceforth crime scene investigation requires a combined effort of police, legal system operators and forensic experts.[2]

Forensic Odontology (FO) is defined as that branch of forensic medicine, which in the interest of justice, deals with proper handling and examination of dental evidence and also with proper evaluation and presentation of the dental findings in the court of law.[3] Forensic odontology encompasses a wide range of domains, including dental age estimation, bite mark analysis, lip print analysis, and advanced DNA profiling. In addition to its pivotal role in the identification of unknown individuals, it also contributes significantly to various aspects of crime scene investigation. The assassination of Rajiv Gandhi is one of the most well-known cases in which the suicide bomber was identified through dental evidence, particularly teeth and jaw fragments, despite extensive mutilation of soft tissues.

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Similarly, bite mark analysis may assist in establishing the identity of an assailant or in determining an individual's involvement in specific criminal activities, including cases of sexual assault.

Bharatiya Sakshya Adhiniyam (2024), previously called the Indian evidence act (1872), depicts the modernized evidence law. Section 45 of this law states the admissibility of all kinds of evidence, including the expert evidence, as a part of comprehensive criminal law reform. [4] In context of FO, dentist is regarded as an expert witness as they hold specialized knowledge in the field of dental science. [5]

The practical applicability of FO lies in the hands of lawyers, so the aim of this study was to access and evaluate the awareness of FO among the legal professionals in practicing in the 'crime capital of metropolitan city, Delhi'.

Methodology

Study design and participants

A cross-sectional survey was conducted among 280 legal professionals practicing in Delhi over a period of August to September 2025. A structured digital questionnaire, comprising 13 questions and administered via Google Forms, was developed and validated by a panel of practicing legal professionals. Informed consent was obtained from all participants prior to participation. Following preliminary data collection, responses were reviewed for clarity and consistency, and the questionnaire was subsequently refined and recirculated. Only professionals with a minimum of two years of legal practice experience were included in the study.

Questionnaire characteristics

The questionnaire was subdivided into two parts

Part 1

Demographic details including name, gender, professional experience, specialty (criminal/ civil/ commercial law)

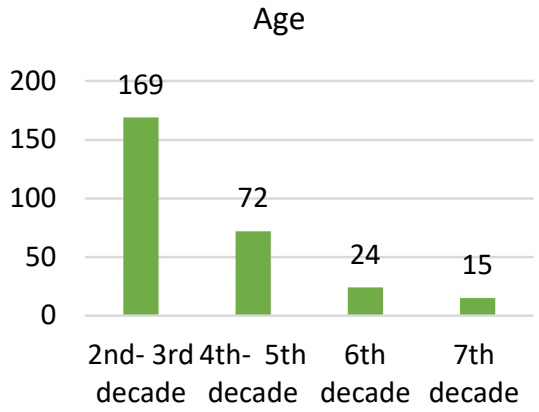

Figure 1: Age group of participants

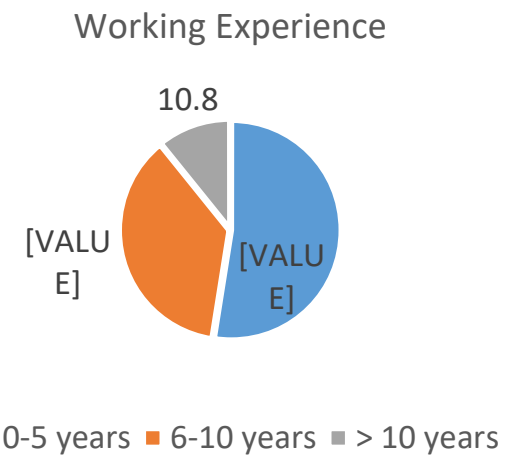

Figure 2: Pie chart depicting the professional experience

Part 2

- Questions related to knowledge in FO, it's application techniques and relevant laws
- pertaining to dentistry.

Statistical analysis

The data collected was analyzed using Statistical Package for the Social Sciences version 11.0. Descriptive statistics for the collected data was recorded. The associations between different variables were tested using the Chi-square test. A p-value less than 0.05 was statistically considered significant.

Questionnaire

The questionnaire administered in this study is depicted in Table 1.

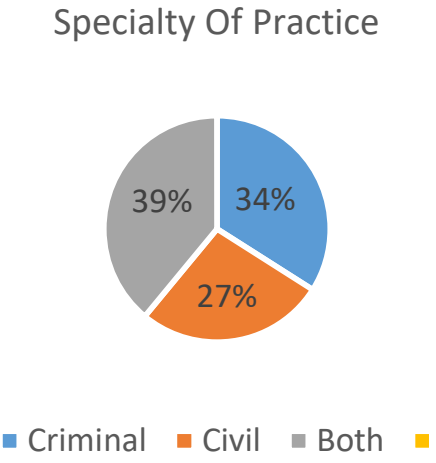

Figure 3: Pie chart depicting the specialty area of practice

Table 1: Questionnaire assessing awareness of FO among legal professionals

Sr. No.	*Question*	*Response*
1	Have you heard about the term 'FO' before?	Yes/ No
2	Do you think age determination can be done with the help of teeth?	Yes/ No/ Maybe
3	FO can determine a person's gender with the help of teeth/ facial bones.	Yes/ No/ Maybe
4	Do you have any knowledge regarding bite mark analysis?	Yes/ No/ Maybe
5	Do you have any knowledge regarding lip print analysis?	Yes/ No/ Maybe
6	Do you have any knowledge regarding palatal rugae (present in upper part of mouth) analysis?	Yes/ No/ Maybe
7	Tooth can be used as a tool for DNA identification.	Yes/ No/ Maybe
8	Identification of deceased can be made even when it is damaged beyond recognition in situations like mass casualties, natural calamities etc. using dental hard tissue evidence.	Yes/ No/ Maybe
9	Tooth fracture or loss is a grievous injury under section 320 of IPC (clause 7)	Yes/ No/ Maybe
10	The court of law accepts the dentist's statement as an expert witness.	Yes/ No/ Maybe
11	Have you ever seen any FO evidence used in a court case?	Yes/ No
12	Do you think FO can help prevent wrongful conviction?	Yes/ No/ Maybe
13	Have you ever been imparted professional knowledge about the use of FO in legal context?	Yes/ No

Results

A total of 280 individuals participated in the study and the response rate was 100%. The sociodemographic details are represented in Figures 1, 2 & 3. Response of each question has been graphically described in the subjacent section. Results pertaining to the practical implications are summarized in Figure 4.

Sociodemographic details

Statistical analysis revealed significant associations across all assessed variables. Awareness of forensic odontology (χ^2 = 9.6, p = 0.002) and knowledge regarding bite mark analysis (χ^2 = 12.7, p = 0.001) demonstrated highly significant associations. Additionally, handling of forensic odontology cases (χ^2 = 5.81, p = 0.016) and knowledge regarding age (χ^2 = 7.5, p = 0.023), gender (χ^2 = 6.7, p = 0.035), and DNA identification using teeth (χ^2 = 6.9, p = 0.031) , tooth fracture or loss as a grievous injury under IPC (χ^2 = 5.4, p = 0.020*) was significant were found to be statistically significant. Overall, the findings indicate a meaningful association between professional experience and awareness and knowledge of forensic odontology among participants (Figure 4).

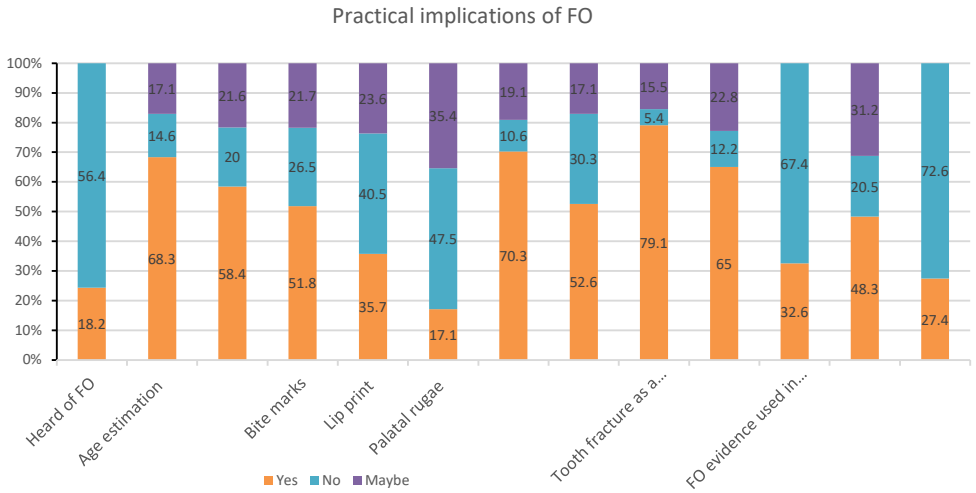

Figure 4: Graphical representation of the practical implications of FO

Discussion

Forensic odontology forms an integral part of forensic sciences that deals with the appropriate handling, examination and presentation of dental evidence in the field of law.

Courtroom uses of dental evidence

Teeth and associated structures have played a major role in forensics. The history dates back to 66AD when the first victim was identified using teeth.[6]

A few Indian cases include the Baburao Ukandu case (2023) and the O.M. baby case (2012) where the conviction of the accused was possible because of bite mark analysis.[7] FO not only aids in the conviction, but also helps in the acquittal of the accused individual as in the Mahindra Singh Dahiya (2011) case, where acquittal was done because of the inconsistent findings regarding the race and age.[6]

The true glory of FO becomes evident when dental evidence is presented in the court, where the responsibility of interpreting and defending it lies with the lawyers.

The present study assessed the awareness and knowledge of FO among legal professionals and revealed an overall statistically significant level of awareness. Awareness of forensic odontology was found to be highly significant ($p = 0.002^*$), indicating increasing recognition of its role in the legal system.

However, practical exposure remains limited, as reflected by the significant association for handling forensic odontology cases ($p = 0.016^*$). This suggests a gap between theoretical awareness and real-world application. Knowledge regarding specific aspects such as age determination ($p = 0.023^*$), gender determination ($p = 0.035^*$), and DNA identification using teeth ($p = 0.031$) was statistically significant, indicating moderate understanding among participants. Notably, bite mark analysis showed a highly significant association ($p = 0.0017^*$), suggesting relatively better awareness in this domain. Additionally, awareness of tooth fracture or loss as a grievous injury under IPC ($p = 0.020^*$) was significant, reflecting familiarity with its medico-legal relevance. Criminal lawyers were overall well oriented about these aspects. Statistically non- significant results were obtained for rest other aspects.

The early role of a relatively small number of dentists in court proceedings has progressed substantially over the past decades, particularly in countries like USA[8] ; but sadly, it's still in a state of infancy in India.[9] Although 48.3% of lawyers agreed that FO can prevent wrongful convictions, only 27.4% had been taught about it during their professional studies.

Study by Selvajothi et al revealed lawyers having more professional experience were better aware of FO, which is similar to our study findings.[10] Level of awareness about legal profession varies considerably among different regions in India.[11] However, our study findings contradicted with the findings of Iyer et al which showed lawyers of 2-3rd decade were overall more aware in comparison to those of the 4th decade & lawyers practicing both criminal and civil law were more aware than those of criminal law, which again contradicts with our findings.[12]

According to Dekov et al there is prompt need for providing short- term lecture courses and publishing expertise guide for lawyers in this forensic field.[8]

Limitations

In this preliminary study, males (59.6%) and females (40.4%) were not distributed equally. The percentage of women in the Indian Bar remains negligible, and a similar pattern was observed in the present study.[13] 52.5% of the participants had a working experience of only upto 5 years, thereby leading to variations in results. The results tend to vary according to the demographical location.

Conclusion

The present study demonstrates a significant level of awareness of FO among legal professionals in Delhi, particularly among those with greater professional experience. Despite this, a noticeable knowledge gap exists between the theoretical knowledge and practical application, as relatively fewer practitioners reported direct involvement in such cases. These findings highlight the need for enhanced interdisciplinary collaboration and structured training programs to strengthen the effective utilization of FO in legal practice.

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