

## ORIGINAL ARTICLE

# Apprehension About Forensic Odontology Amidst Police Personnel in Chennai, India: A Cross-Sectional Survey

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**ABSTRACT**

**Background:** Forensic odontology is a fascinating branch of dentistry which primarily involves the identification of living and deceased individual by comparing the ante and post-mortem records.

**Aim:** This study aims to analyse the awareness about forensic odontology among police personnel in Chennai district, Tamil Nadu, India.

**Method and Material:** Data was collected by means of a questionnaire containing a set of 20 questions that assess the knowledge about forensic odontology, their attitude about the field and their willingness to utilize the forensic odontologist in their practice.

**Statistical Analysis:** The Statistical Package for the Social Sciences version 19.0. was used to analyse the data. Descriptive statistics were employed.

**Results:** The study included both male (500) and female (57) officials. About 23% of them were aware that a forensic odontologist is a general dentist and 51.9% of the participants knew that forensic odontologist is required in case of victim identification in mass disasters, rape cases and child abuse. 75% of the participants agreed that tooth can be used as a tool for identification of gender, age and in DNA analysis. 69.2% of the participants did not agree on the requirement of a forensic odontologist in a crime scene investigation.

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**Conclusion:** Majority of the police officials felt that there exists a less recognition of forensic dentistry in India, as well, the officials felt that the forensic dentistry plays an essential role only in rape cases and related murder.

## KEYWORDS

• Chennai • Police officials • Forensic odontology • Forensic dentistry • Crime Scene Investigation

## INTRODUCTION

Forensic odontology, a captivating field within dentistry, primarily focuses on identifying living and deceased individuals by comparing their pre and post-mortem dental records.<sup>1</sup> It applies scientific principles and technology to detect and investigate crimes, contributing to the dispensation of justice. According to the Federation Dentaire Internationale (FDI), forensic odontology involves the meticulous examination of dental evidence, along with the thorough assessment and preservation of dental findings, are essential in the pursuit of justice.<sup>2</sup>

The origins of dental identification trace back to 66 AD, while its formal acceptance in legal contexts began much later, notably in Paris in 1987 during a mass disaster. Despite its significance, there are a limited number of institutions providing formal training in forensic odontology, leading to a dearth of opportunities for qualified professionals who have acquired overseas degrees.<sup>1</sup>

The pivotal implementation of forensic odontology encompasses identifying individuals or human remains using existing dental records during calamities. It also involves assessing bite marks in cases of abuse, determining an individual's age and gender, and presenting evidence as an expert witness in court.<sup>3</sup> Dental tissues' resilience against environmental damage and their ability to retain their original structure play a crucial role in solving various cases. Forensic odontology utilizes methods such as tooth prints, radiographs, photographs, rugoscopy, cheiloscopia, and molecular techniques like DNA fingerprinting for accurate diagnosis.<sup>4</sup>

It is essential to provide police personnel with awareness about the role of forensic odontologists and their significance in crime scene investigations. Dental remains serve as an accurate means of identifying victims, perpetrators, or individuals involved in a

crime. Natural and man-made disasters, along with rising crime rates including instances of child abuse and gang rape, underscore the important role of forensic odontologists in identifying individuals and delving deeper into criminal investigations<sup>5</sup>.

As first responders to crime scenes, police personnel play a crucial role in maintaining the chain of custody and collecting available evidence. Their understanding of identifying and collecting biological evidence, dental prosthetics, and hard tissues becomes essential in the burgeoning field of forensic odontology.<sup>2</sup>

Given the significance outlined above, a study was conducted in Chennai, Tamil Nadu, India, through a questionnaire-based survey to evaluate the awareness and adherence to Forensic Odontology among policeman.

## METHODS

### Study Design

The study has been presented to the Institutional review board and cleared the IRB with protocol clearance number MADC/IRB-XX/2018/348. This Cross-sectional survey was done among the policeman of various cadres in Chennai district. Convenience sampling was used to draw the sample. The police personnel from four different zones of Chennai city (North, South, West, East) were included in the study. A total of 557 participants of which 500 males and 57 females were surveyed.

### Objectives

This study has two main objectives: firstly, to assess the apprehension and understanding of the utilization of forensic odontology during evidence collection by crime scene investigators, and secondly, to determine the knowledge scores of individuals in various

facets of forensic odontology.

**Inclusion Criteria**

Police personnel who gave their consent, officials from cadre of Constable to Superintendent of Police, both male and females of age range 28-58 years participated in the survey. Those officials who handle cases of criminal and civil law are majorly included. The legal professionals were asked voluntarily to participate in the study, and the confidentiality was respected.

**Questionnaire**

A questionnaire was developed specifically to gauge participants’ awareness, familiarity, and utilization of forensic odontology within their field. All participants were briefed about the study’s nature. The questionnaire comprised two sections: The initial segment gathered demographic information such as age, gender, work nature, and professional experience. The subsequent section encompassed 20 questions pertaining to forensic odontology, covering topics like its techniques, application, relevant evidence, and legal aspects associated with dentistry. (supplementary 1).

**Validation**

The questionnaire was validated by three professionals and based on their inputs it was reconstructed. A pilot study was conducted among 50 police personnel and the sample size was determined. Reliability test (CA) was conducted using SPSS software to maintain the internal quality.

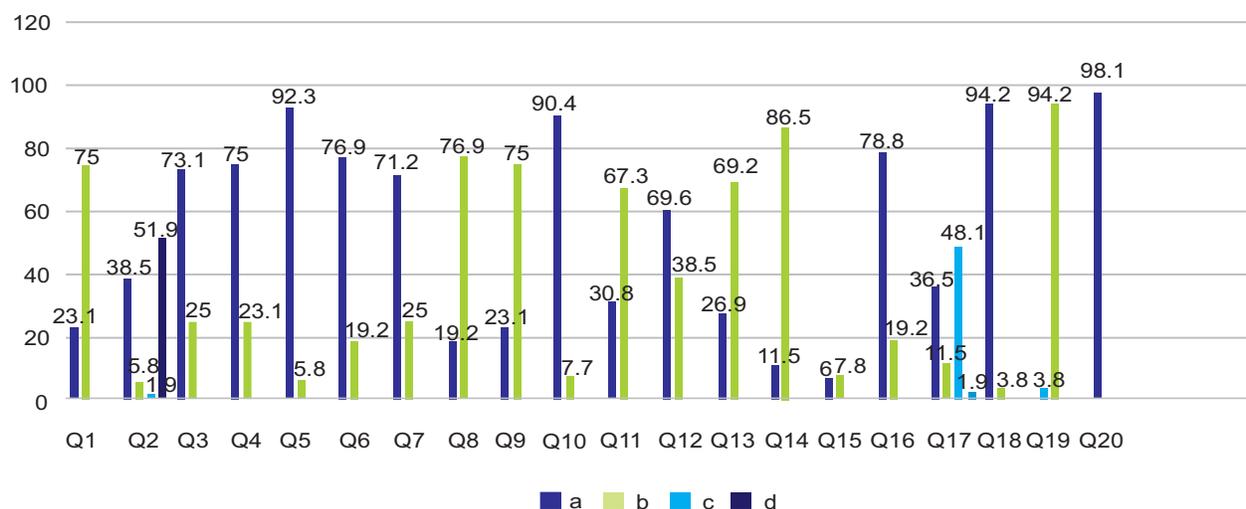
**Statistical Analysis**

The questions and corresponding responses were assigned numerical codes to streamline the process of data entry and subsequent analysis. Collected data underwent analysis utilizing the Statistical Package for the Social Sciences version 19.0. Descriptive statistics were employed to record and analyse the gathered data.

**RESULTS**

A total of 20 questions were distributed among the policeman and the response rate was 100%. The study cohort comprised of 500 male and 57 female police personnel. Police personnel less than fourth decade of age comprised of 19%, and more than fourth decade accounted for 31%.

On analysing the collected data, it was found that 23% of the participants were aware of the fact that forensic odontologists are also general dentists. 51.9% of the participants were aware about the essentiality and requirement of a forensic odontologist not only in case of victim identification in mass disasters but also in rape cases and cases of child abuse. Three-fourth of the participants agreed that a tooth can aid in the identification gender and age, in DNA analysis and also accepted that the hardest part in human body is the enamel. But, 69.2% of the study population stated that forensic odontologists are not required in case of any Crime Scene Investigations (Figure 1).



**Figure 1:** Graphical representation of descriptive analysis of the questionnaire

**Table 1:** Pearson Chi-Square test to relate experience of the police personnel to the knowledge about FO

	Case Processing Summary						
	Cases						
	Valid		Missing		Total		P value
N	Percent	N	Percent	N	Percent		
Experience * Q7	551	99.1%	5	0.9%	556	100.0%	0.000
Experience * Q13	537	96.6%	19	3.4%	556	100.0%	0.002
Experience * Q14	556	100.0%	0	0.0%	556	100.0%	0.000
Experience * Q18	556	100.0%	0	0.0%	556	100.0%	0.303
Experience * Q19	556	100.0%	0	0.0%	556	100.0%	0.005

## DISCUSSION

In the present circumstances, the police typically handle crime scene evaluation and the gathering of evidence, which is challenging and diligent task. Achieving success in this process requires thorough planning and the active engagement of various agencies, including forensic specialists such as crime scene investigators, forensic biologists, forensic pathologists, forensic toxicologists, and forensic odontologists.<sup>6</sup> Our study was tailored to assess the knowledge of FO among policeman in Chennai. The result of the survey revealed that although the knowledge about FO is adequate ( $p < 0.001$ , Table 1), there is a lack of facilities in the application of this knowledge and application of forensic dentistry in practice. Forensic odontology stands as an intricate and captivating division within forensic science, focusing on utilizing dental expertise to identify individuals, whether living or deceased. This field encompasses the acknowledgment, recording, analysis, and presentation of related dental evidence in forensic investigations.<sup>1,2</sup> This particular niche within dentistry specializes in addressing legal matters wherein dental evidence becomes pivotal for identifying victims, suspects, and individuals involved in organized crime. Teeth, being the most resilient human body tissue, withstand considerable physical alterations, making them invaluable in such cases. Law enforcement officers play a crucial role in collecting and presenting this evidence.<sup>6</sup> Understanding the diverse facets of forensics, alongside in-depth knowledge of dental sciences and the evidence associated with them, offers a significant opportunity for forensic odontologists to actively engage in identifying both the accused and victims in legal

cases.<sup>7</sup> This survey is performed to evaluate the knowledge and awareness about the utilization of forensic odontology during evidence collection by the crime scene investigation (CSI) officers. This survey's aggregate outcome are that 19% of the participant were under the age of 40; Knowledge about forensic dentistry was observed in 60-75% of the CSI; practicality of forensic dentistry in crime scene investigation was about 40-50%; willingness to apply the same in their practice was >30%; 98% of the CSI believed that loss of teeth due to physical assault is a grievous injury; Officials of all cadres had no idea about the application of forensic dentistry in civil cases.

Crime scene analysis involves collaboration between crime scene investigators and forensic experts. Upon receiving notification of a crime, the investigators promptly arrive at the scene. They meticulously gather evidence, take detailed measurements of the area, create sketches and diagrams, document remains and evidence through photography, and meticulously record all findings. Subsequently, they appropriately pack, label, and transfer the collected evidence to the laboratory for further analysis.<sup>8</sup> Meanwhile, forensic experts play a crucial role in this process. They collect evidence, interpret the results derived from analysis, ensure the preservation of evidence, and communicate their findings as expert witnesses during legal proceedings.<sup>2</sup>

On analysing the question, usage of dental records in victim identification it was assessed that as the experience of police personnel increased their need for dental records in CSI was lessened (Supplementary1 \*Q7). One police official confidently stated that the involvement of a forensic dentist in CSI isn't necessary. Majority of them felt there is less recognition

of forensic dentistry in India. Majority of the officials had an opinion that forensic dentistry is more useful in only rape cases and related murder and that its application towards victim identification in mass disasters, suspect identification is less (Figure 1).

The lack of awareness regarding the significance of biological evidence often results in the inadvertent loss of crucial evidence. For instance, bite marks or lip prints might be inadvertently destroyed by hospital staff. Similarly, evidence collectors may overlook avulsed teeth, dentures, or dental restorations, leading to their omission.<sup>9</sup>

Legal professionals who lack understanding of forensic odontology may struggle to adequately assess and manage scientific evidence. Consequently, this lack of comprehension can significantly impede the pursuit of justice, potentially resulting in factual errors. However, having a forensic odontologist present during evidence collection can mitigate these issues. Their expertise becomes invaluable as even a missing tooth can provide critical clues, acting as a vital link in an investigation.<sup>10</sup>

Forensic odontologists play a crucial role in identifying human remains when traditional methods such as fingerprints or DNA analysis are not feasible. By this study few officials were not aware of the role of DNA analysis from tooth remains and majority did not have even heard of role of tooth prints in person identification (Fig 1. Q11). Dental records are often the most reliable way to establish a person's identity, especially in cases where bodies are severely decomposed or disfigured. This becomes especially important in natural disasters, mass casualties, and criminal cases.<sup>11</sup> Technically dental records are to be maintained for lifetime, Dental Council of India mandates all the practising dentists to preserve dental records at-least upto 8 years whereas by Gazette No.DE-97-2014 Section 20 / Section 17A of the Dentists Act, 1948 (16 of 1948) dental records are to be maintained for minimum for a period of 3 years (Supplementary 2). Bite mark analysis, a subset of forensic odontology, is used to analyse bite mark patterns on victims and compare them with dental impressions of suspects. While controversial due to its subjective nature, advances in technology and research have improved the reliability of bite mark analysis, making it a valuable tool in

certain investigations. In Annigeri, Karnataka number of human skulls identified possibly due to genocide were analysed by FO to identify the gender and also possibly the time (1790) when the crime would have happened. But the identification of human body (M. Raja Jayachandra Rathore) using dental prosthesis was dated way back in 1191.<sup>12</sup>

As experience accumulates, law enforcement officials, forensic experts, and legal professionals could have become more aware of the potential of forensic odontology. Training programs and awareness campaigns conducted regularly by Indian Association of Forensic Odontology (IAFO) and other institutions have contributed to the understanding of its applications and limitations. This increased awareness has led to a greater acceptance of forensic odontology as a legitimate and important part of the crime scene investigation process.<sup>13</sup>

However, it's important to note that forensic odontology, like any forensic science, has its limitations and challenges. Ongoing research and advancements in technology are essential to enhance the reliability and accuracy of methods used by forensic odontologists<sup>14</sup>. Additionally, interdisciplinary collaboration between forensic odontologists, law enforcement authorities, and other forensic experts further strengthens the credibility of their findings in the court of law.

International organizations, such as the International Association for Identification (IAI), the American Board of Forensic Odontology (ABFO), the International Association of Forensic Sciences (IAFS), National Forensic Sciences University, Gujarat and IAFO promote and support the use of forensic dentistry. These organizations help establish standards and guidelines for forensic dental practice, ensuring that the discipline is conducted with scientific rigor and accuracy.<sup>7</sup>

While the acceptance and use of forensic dentistry may vary from one country to another, it is generally considered a valuable and established field within forensic science and law enforcement worldwide. However, like any forensic discipline, it is subject to ongoing research and scrutiny to improve its reliability and validity in criminal investigations.

## CONCLUSIONS

Through this study, we would like to highlight

that, awareness among police personnel in Chennai about the role of forensic odontologist is not satisfactory. It's a well-established fact that the presence of forensic odontologists significantly enhances the accuracy of identification methods by comparing pre- and post-mortem details acquired through circumstantial and physical examinations at a crime scene. Dental examination, a pivotal and highly effective method, necessitates the expertise of forensic dental specialists. These experts conduct oral examinations (oral autopsies) as a part of the overall autopsy process. Extracted teeth, maxillofacial prostheses, or implants obtained during this examination can be utilized to determine the age and gender of an individual by comparing the records provided by dentists before death (antemortem records). Dentists are mandated to retain and preserve patient documents and study models for a minimum of 3-5 years due to legal requirements. Additionally, visits by investigative officers to forensic odontology centres serve as valuable opportunities for them to acquaint themselves with the latest advancements in the field of forensic odontology. Such familiarization visits are instrumental in enhancing their understanding of recent developments in the discipline.

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