International Journal of Forensic Expert Alliance
https://doi.org/10.70818/ijfea.v02i01.024
Vol. 2, No. 1, 2025

ISSN (Print): 3078-6673
ISSN (Online): 3078-6681

REVIEW | OPEN ACCESS

Necessity for Establishing Forensic Odontology Protocols in Asian Countries

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ABSTRACT: Forensic odontology, also known as forensic dentistry, represents a crucial segment of forensic science that utilises dental expertise in legal investigations. It plays a significant role in human identification in scenarios involving criminal acts, mass casualties, and civil conflicts. By examining dental structures, including teeth, bite marks, restorations, and oral tissues, forensic odontologists aid in estimating age, assessing trauma, and identifying victims whose remains are decomposed, charred, or fragmented. The strength of dental tissues in tough conditions makes dental evidence highly reliable in forensic cases. Their ability to withstand damage or extreme environments ensures they remain useful for identification and analysis. This durability allows forensic odontologists to gather important clues even when other evidence has been compromised. Nevertheless, in Asian countries, the adoption of standardised protocols in forensic odontology is still lacking. This research underscores the present necessity for the establishment and implementation of standardised protocols of forensic odontology in Asian countries to guarantee the generation of accurate, consistent, and legally acceptable outcomes. These protocols ought to offer explicit instructions for the collection, documentation, preservation, and comparison of dental evidence, integrating innovations such as radiographic imaging and DNA analysis. Standardisation not only improves consistency and diminishes interpretative bias among examiners but also bolsters the scientific credibility of forensic dental evidence, especially in legal contexts. The paper examines various obstacles to the implementation of protocols in Asian countries, which include inadequate professional training, a lack of awareness among law enforcement agencies, insufficient infrastructure, and regulatory hurdles. To tackle these challenges, the paper suggests establishing specialised forensic odontology laboratories, developing national-level training and certification programs, and fostering collaboration among dental professionals, forensic scientists, law enforcement, and legal authorities. Additionally, it advocates for public awareness campaigns and the integration of modern digital technologies to bolster these initiatives. In conclusion, the development and execution of standardised forensic odontology protocols are essential for the progress of forensic science in Asian countries. These actions will enhance identification accuracy, especially in mass casualty situations, strengthen the reliability of dental evidence in judicial proceedings, and contribute to a more effective and equitable legal system.

Keywords: Forensic, Forensic Odontology, Advocate, Human Identification, Dental Evidence.

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How to cite this article:
Gorea RK, Khatodiya RS, Malhotra K, Sumit, Soin S; Necessity for Establishing Forensic Odontology Protocols in Asian Countries. *Int. J. Forensic Expert Alliance*. 2025; 2 (1): 96-100.

Article history:
Received: January 30, 2025
Revised: March 12, 2025
Accepted: April 24, 2025
Published: June 30, 2025

Peer Review Process:
The Journal abides by a double-blind peer review process such that the journal does not disclose the identity of the reviewer(s) to the author(s) and does not disclose the identity of the author(s) to the reviewer(s).

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INTRODUCTION

Forensic odontology, or forensic dentistry, applies dental science to legal investigations, aiding in human identification through teeth, bite marks, and oral structures.[1] It plays a vital role in mass disasters and crime cases due to the durability of dental evidence, necessitating standardised protocols for accurate and reliable identification, especially in Asian countries. Forensic odontologists use their expertise in teeth, bite marks, and oral structures to identify human remains, analyse bite marks, and assist in various aspects of legal cases. This discipline has played a pivotal role in solving crimes, identifying victims of mass disasters, and providing crucial evidence in courtrooms worldwide.[2] Forensic odontology, the application of dental science to legal

investigations, plays a crucial role in human identification, particularly in mass disasters, criminal investigations, and civil cases. Dental evidence is strong in nature; it resists extreme temperatures and various physical and chemical attacks as well.[3, 4] This is why, in mass disasters, where highly decomposed, skeletonised, charred, or fragmented remains are found, forensic odontology comes into play. It has the most crucial role in identification.[5] The establishment of standardised forensic odontology protocols in Asian countries is essential to ensure accurate, reliable, and legally defensible results in such investigations. The ability to reliably identify individuals is fundamental, especially with increasing mobility in a highly networked world.[6]

Background of Forensic Odontology

In legal proceedings, forensic odontology plays a very important role, involving the examination, evaluation and presentation of dental evidence. Forensic odontology is the analysis, assessment, and presentation of dental evidence for use in legal cases.[7] Dental identification relies on the unique characteristics of an individual's teeth and dental restorations, which can withstand extreme conditions such as fire, decomposition, and trauma.[8] These characteristics are documented through dental records, radiographs, and photographs, which serve as valuable ante-mortem data for comparison with post-mortem findings. Bite mark analysis, another aspect of forensic odontology, involves the comparison of bite marks found on victims or suspects with the dentition of potential perpetrators. The reliability of bite mark analysis has been challenged mainly due to issues with subjective interpretation.[9] Forensic Facial Reconstruction is another sub-domain of forensic odontology that is widely utilised in the recent forensic world.[10] In forensic cases, where skulls are recovered from the crime scene, the face of an individual is built onto the skull using facial reconstruction for identification. Facial reconstruction is a combination of both scientific methods and artistic skills. Various methods of facial reconstruction exist, ranging from simple two-dimensional sketches to detailed three-dimensional clay models. Recent advances in 3D technology have led to a quick, reliable, and affordable computer-based 3D reconstruction process as well, which reduces errors before the face is fully built.[11] Facial recognition helps authorities identify potential victims more efficiently. They can compile a list of possible matches, which can then be confirmed through traditional forensic techniques. This process makes it easier for families and friends to recognise the individual, providing a clearer and more certain identification.[12] The protocols governing forensic odontology encompass a wide range of procedures, including the collection and preservation of dental evidence, radiographic techniques, dental profiling, and the comparison of ante-mortem and post-mortem data. Standardised protocols ensure that each step is performed consistently and accurately, minimising the risk of errors and biases.[13] The development and implementation of forensic odontology protocols in India require a multi-faceted approach, involving collaboration between dental professionals, forensic scientists, law enforcement agencies, and government bodies. This collaborative effort should focus on establishing training programs, accreditation standards, and quality assurance measures to ensure the competence and reliability of forensic odontologists.[14]

Importance of Establishing Protocols in Asian Countries

The establishment of standardised forensic odontology protocols in Asian countries is of paramount importance for several reasons. Firstly, it enhances the accuracy and reliability of dental identifications, ensuring that innocent individuals are not wrongly implicated in criminal investigations. Standardised procedures minimise the risk of subjective interpretation and bias, leading to more objective and defensible conclusions. Secondly, protocols facilitate the efficient and effective management of mass disasters, where dental identification is often the primary means of identifying victims. In mass fatality events, where the integrity of remains is compromised, multiple biological parameters, such as age, stature, previous dental procedures, and skeletal disease, are essential for deducing a presumptive identity.[6] Standardised protocols enable forensic odontologists to rapidly collect, analyse, and compare dental data, expediting the identification process and providing closure to grieving families. Thirdly, protocols are crucial for validating dental evidence in court.[13] The forensic sciences are essential in obtaining solid scientific evidence that guarantees fair and accurate decisions in the courts of law.[15] Nowadays, many countries have developed certain dental software that can aid in disaster victim identification. WinID is one such

software, developed by Dr. Jim McGivney, that shares the characteristic of recording details of all tooth surfaces and has been utilised in various mass disasters. Adherence to established protocols enhances the credibility of dental evidence, making it more likely to be accepted by judges and juries.

Key Elements of Forensic Odontology Protocols

Comprehensive forensic odontology protocols should include several key elements to ensure their effectiveness and reliability. Firstly, detailed guidelines for the collection, preservation, and documentation of dental evidence are essential. This includes protocols for photographing, radiographing, and sectioning jaws to assist with identification.[9] These guidelines should specify the proper techniques for handling teeth, soft tissues, and dental appliances, as well as the chain of custody procedures to maintain the integrity of the evidence. Secondly, protocols should outline the procedures for dental profiling, including the recording of dental characteristics such as tooth morphology, fillings, and anomalies.[9] This information can be used to create a dental profile of an individual, which can be compared with ante-mortem records or used to narrow down the pool of potential matches. Thirdly, protocols should address the methods for comparing ante-mortem and post-mortem dental data. This includes guidelines for radiographic comparison, charting discrepancies, and assessing the significance of matches and inconsistencies. The failure to recognise evidence, collect it properly, or preserve it using the correct protocol can compromise the evidence, rendering it useless for laboratory procedures.[3] Protocols should also address the use of computer-assisted identification systems, which can streamline the comparison process and improve accuracy. Standardised Protocols Can Improve the Reliability of Forensic Odontology in Legal Cases.

Establishing Consistency Across Examiners

Standardisation minimises discrepancies between examiners' findings and increases the reproducibility of results across different cases. By defining clear guidelines for procedures such as dental record comparison or bite mark analysis, standardised protocols ensure that all prisoners follow the same steps. This reduces subjective interpretations and ensures uniformity in how evidence is analysed. For example, protocols could specify how to photograph bite marks, measure distortions on skin, or compare dental moulds with suspected impressions.[16]

Improving Scientific Validation

Forensic odontology is the lack of empirical validation for certain methods, such as bite mark analysis. The absence of robust scientific studies supporting claims like "uniqueness" of dentition has led to questions about admissibility in court. Protocols can mandate the use of scientifically validated methods only.[17]

For instance:

Bite mark comparisons should incorporate advanced technologies like 3D imaging or digital overlays rather than relying solely on visual assessments.[18]

DNA extraction from dental tissues may be preferred over subjective pattern-matching techniques. They can also require practitioners to document error rates and provide statistical probabilities for their conclusions.[19]

Reducing Bias Through Blind Testing

Knowing details about suspects or case circumstances can unconsciously influence their conclusions. This affects forensic odontologists' objectivity. Blind testing ensures that conclusions are based solely on objective evidence rather than external influences. Protocols can enforce blind testing procedures where odontologists analyse evidence without knowledge of case details or suspect identities. Double-blind methodologies could also be implemented to further reduce cognitive bias.[20]

Enhancing Training and Certification on Standards

Uniform training ensures that all practitioners possess a baseline level of expertise, reducing errors caused by inadequate knowledge or skills. Protocols can establish mandatory training programs focused on best practices, technological tools (e.g., digital imaging), and ethical Considerations. Certification bodies like the American Board of Forensic Odontology (ABFO) could adopt stricter requirements for accreditation based on adherence to these protocols.[16]

Addressing Ethical Considerations Through Guidelines

Ethical standards ensure that findings remain unbiased and grounded in science rather than external pressures. Develop legal and ethical

guidelines to enhance impartiality and uphold scientific integrity. Include provisions for handling conflicts of interest or refusing cases where evidence quality is insufficient for reliable conclusions.[16]

Challenges in Implementing Protocols

Despite the clear benefits of establishing forensic odontology protocols, several challenges may hinder their implementation in Asia, especially in India. Firstly, the lack of awareness and training among dental professionals and law enforcement agencies is a significant obstacle. Many dentists may not be familiar with forensic odontology techniques or the importance of preserving dental evidence in criminal investigations. The correct digital forensic seizing involves preparation of professionals from the fields of law, police, and computer science.[14] Similarly, law enforcement officers may not appreciate the value of dental evidence or know how to properly collect and submit it for analysis. Secondly, limited resources and infrastructure can impede the implementation of protocols. Setting up forensic odontology laboratories and training centres requires significant financial investment, which may not be readily available in all parts of the country. Thirdly, legal and regulatory hurdles records, making it difficult to obtain ante-mortem data for comparison purposes.[21]

Recommendations for Effective Protocol Development for Forensic Odontology in Asia

To overcome these challenges and ensure the successful implementation of forensic odontology protocols in Asia, several recommendations should be considered. Firstly, comprehensive training programs should be developed for dental professionals, forensic scientists, and law enforcement agencies.[21] These programs should cover all aspects of forensic odontology, from evidence collection and preservation to dental profiling and comparison techniques. Secondly, the government should invest in establishing forensic odontology laboratories and training centres across the country. These facilities should be equipped with the latest technology and staffed by qualified personnel. Thirdly, efforts should be made to raise awareness among the public about the role of forensic odontology in criminal investigations. Community awareness campaigns can help dispel myths and promote the use of dental evidence in court.[22] Open digital systems may be beneficial, allowing dental professionals to tailor growing digital technology to individual needs without affecting clinical excellence or practice efficiency.[23] Finally, collaboration and communication between forensic odontologists, law enforcement agencies, and legal professionals should be fostered to ensure the effective use of dental evidence in the justice system. This will improve both policy making and model building to reduce the risk of crimes and for crime prevention.[24] Forensic Odontologists must be taken to all mass disaster sites and assigned specific Forensic Odontology units/ labs in different regions of our country. This will ensure quicker and accurate identification and the proper utilisation of Forensic Dentistry in meticulously identifying remains in the aftermath of mass disasters in Asia.[8]

CONCLUSION

The establishment and strict adherence to standardised forensic odontology protocols in Asian countries are imperative to enhance the reliability and scientific validity of dental evidence in legal investigations. This will ensure consistent practices across examiners, reduce biases, improve training and certification standards, and uphold ethical considerations, ultimately strengthening the justice system's ability to accurately identify victims and solve crimes. Overcoming challenges through government support, resource allocation, and collaborative efforts among dental professionals, forensic scientists, and law enforcement agencies will enable forensic odontology to play an even more effective role in mass disaster management and criminal investigations throughout Asia.

Funding: None
Conflict of Interest: None

REFERENCES

1. Vidal-Parra M, Fonseca GM. Orthodontic records for forensic identification: A scoping review. Spanish Journal of Legal Medicine. 2022;48(2):78–83.
2. Balhareth AAS, Jamesh M, Zabarah GA, Almotlaq MM, Alabaaltahin M Ali Madran, Jaarah AHAA, et al. The Role of Forensic Medicine in Modern Criminal Justice: A Review of Current Practices and Innovations. Journal of Ecohumanism. 2024 Nov 11;3(7):2699–707.
3. Krishan K, Kanchan T, Garg AK. Dental evidence in forensic identification–An overview,

methodology and present status. The open dentistry journal. 2015;9:250.
4. Gorea R. Forensic Odontology in the 21st Century. Journal of Indo Pacific Academy of Forensic Odontology. 2021;11(1):4–9.
5. Mânica S, Kouble R, Adam C. Forensic Odontology. In: Mason's Forensic Medicine and the Law. 7th ed. Doughty Street Chambers: Bloomsbury; 2023. p. 315–30.
6. Pillai JP, Chokkalingam TS, Aasaithambi B, Nuzzolese E. Establishment of the forensic odontology department: A proposed model for the basic infrastructure and forensic odontology kit. Journal of Forensic Dental Sciences. 2019;11(2):64–72.
7. Patil K. Role of Forensic Dentistry in Solving Legal Issues: An Overview of Forensic Odontology. Journal of Forensic Biomechanics. 2023;14(1):1.
8. Chatterjee S. Dental Profiling & Their Recent Advancements In Forensic Odontology. IOSR Journal of Dental and Medical Sciences. 2024;
9. Abdel Naser ME. Role of forensic odontology in identification of persons: a review article. Cureus [Internet]. 2024 [cited 2025 Sep 17];16(3). Available from: https://www.cureus.com/articles/239937-role-of-forensic-odontology-in-identification-of-persons-a-review-article.pdf
10. Kundu A, Streed M, Galzi PJ, Johnson A. A detailed review of forensic facial reconstruction techniques. Med Leg J. 2021 Jun;89(2):106–16.
11. Gupta S, Gupta V, Vij H, Vij R, Tyagi N. Forensic facial reconstruction: the final frontier. Journal of clinical and diagnostic research: JCDR. 2015;9(9):ZE26.
12. Jeddy N, Ravi S, Radhika T. Current trends in forensic odontology. Journal of Forensic Dental Sciences. 2017;9(3):115–9.
13. Reczek K. Standards and Guidelines in Forensic Odontology. 2022. (NIST Interagency Report). Report No.: NIST IR 8352sup2.
14. Shamim T. Forensic odontology. Journal of the College of Physicians and Surgeons Pakistan. 2012;22(4):240–5.
15. Rakoff J, Liu G. Forensic science: A judicial perspective. 2023 p. 120–41. (Proceedings of the National Academy of Sciences of the United States of America).
16. AMERICAN BOARD OF FORENSIC ODONTOLOGY (ABFO) Standards and Guidelines for Evaluating Bitemarks.
17. Lacasella GV, Signorini L, Ballini A, Bizzoca ME, Musella G, Muzio EL, et al. Forensic odontology: a comprehensive review of advances and applications in dental forensic medicine. Minerva dental and oral science [Internet]. 2025 [cited 2025 Sep 17]; Available from: https://pubmed.ncbi.nlm.nih.gov/40340272/
18. Christoloukas N, Mitsea A, Rontogianni A, Papadakis E, Angelopoulos C. Evaluation of Bitemark Analysis's Potential Application in Forensic Identification: A Systematic Review. Diagnostics. 2024;14(11):1180.
19. Salazar A, Huerta P, Coliboro-Dannich V, Castro A, Barbaro A. Evaluation of DNA in human teeth—ante-mortem and post-mortem factors affecting degradation and preservation: a literature review. Genes. 2025;16(4):364.
20. Saks MJ, Albright T, Bohan TL, Bierer BE, Bowers CM, Bush MA, et al. Forensic bitemark identification: weak foundations, exaggerated claims. Journal of Law and the Biosciences. 2016;3(3):538–75.
21. Dinakar A. Forensic odontology: Trends in India. Journal of Forensic Dental Sciences. 2014;6(1):1–2.
22. Gupta S, Prateek G, Singla B. The Changing Trend of Forensic Odontology in India - A Review Article. 2025;
23. Anadioti E, Musharbash L, Blatz MB, Papavasiliou G, Kamposiora P. 3D printed complete removable dental prostheses: a narrative review. BMC Oral Health. 2020 Dec;20(1):343.
24. Kanwat K. The Role Of Forensic Evidence In Criminal Investigations In India. 2024;12:2320–882.