Assessment of knowledge and awareness of forensic odontology among dentists in Tamil Nadu – A systematic review

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Abstract

Aim: The aim of the study is to analyze the knowledge, attitude and practice of forensic odontology among dental practitioners in Tamil Nadu.

Materials and Methods: Forensic odontology has immense importance in examining dental evidence and in the identification of victims of mass disaster, abuse or organized crimes. Hence, a cross-sectional survey study was conducted in a sample of 252 dental practitioners practicing in various cities in Tamil Nadu. A questionnaire comprising 22 questions (both open ended and close ended) was prepared, and the survey was conducted to analyze the knowledge and attitude of dentists toward forensic odontology.

Results: Many of the practicing dentists had a basic knowledge about forensic odontology, but only 22% knew about the existence of a national association for forensic odontology. Forty-five percent of them knew about cheiloscopy. Seven percent of them only knew about the forensic courses available in India. Ninety-eight percent of them did not have any formal training related to forensic odontology. Seventy-two percent of them were not confident about giving an opinion for a forensic case. Most of them felt that our country has very limited resources for forensic odontology.

Conclusion: This study showed that the branch of forensic odontology is still in the infant stage in the state. This condition, however, could be improved if more formal training courses are conducted by the specialist associations imparting knowledge and training in the field.

Keywords: Awareness, dental practitioners, forensic odontology, knowledge, Tamil Nadu state

INTRODUCTION

The word forensic is derived from Latin word “forensis” which means public. Forensic science can be used in a judicial setting and accepted by the court.[1] Forensic dentistry, a branch of forensic science, involves the identification of deceased individuals by application of dental sciences through the comparison of ante- and postmortem records. Forensic odontology deals with handling and examination of dental evidence and evaluation and presentation of dental findings.[2] Forensic odontology

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has immense importance in examining dental evidence and in the identification of victims of mass disaster, abuse or organized crimes. The characteristics of dental tissues remain unchanged even in extreme cold or hot and are the strongest tissues in the human body.[3] The importance of forensic odontology is increasing in the identification of bodies of the victims which have become mutilated beyond recognition in natural and man-made disasters.[4] Hence, a survey was conducted with the aim to assess the knowledge and attitude toward forensic odontology in Tamil Nadu.

MATERIALS AND METHODS

The present cross-sectional survey study was conducted in different cities across the state of Tamil Nadu including Chennai, Tiruchchirappalli, Pondicherry, Coimbatore and Salem. The surveyed individuals included both dental faculty members of various dental specialties and practicing dental surgeons. Data were collected in a personalized manner by means of a questionnaire. The questionnaire [Table 1] consisted of 22 questions to assess the awareness and knowledge of dental faculty members and dental practitioners in the field of forensic odontology. The questions were both open ended and close ended. The results were calculated on a percentage basis and tabulated.

RESULTS

Knowledge

Forty-six percent of the dental practitioners did not know the accurate and sensitive way to identify an individual. The remaining 54% answered that DNA and fingerprints would be an accurate and sensitive method for identification. Twenty percent of the dental practitioners did not know dental age estimation by examining the teeth. Forty-five percent and 34% of the participated dentists knew age and sex identification of victims from skeletal remains, respectively. Fifty-four percent of them were not aware of Barr bodies. Fifty-three percent of the dental practitioners did not know to identify the age and gender of the deceased in the event of a mass disaster.

Thirty percent of the dental practitioners did not know to identify child abuse, whereas the rest said that they would identify by physical injuries, scars, behavior, etc. Eighty percent of them said that they would inform the parents if they identified a child abuse case. About 32% of the dental practitioners did not know the significance of bite mark patterns of the teeth.

Dental record maintenance

Twenty-two percent of the dental practitioners did not maintain dental records in their clinic. Among those who maintained, only 15% maintained complete dental records. Such maintenance of dental records was limited to a period of <5 years in majority of the clinics. Only 19% of the dentists who maintained dental records knew its significance in identification of crime suspects and deceased individuals.

Awareness

Many of the practicing dentists had a basic knowledge about forensic odontology, but only 22% knew about the existence of a national association for forensic odontology. Forty-five percent of them knew about cheiloscopy. Seven percent of them only knew about the forensic courses available in India. Ninety-eight percent of them did not have any formal training related to forensic odontology. Seventy-two percent of them were not confident about giving an opinion for a forensic case. Most of them felt that our country has very limited resources for forensic odontology.

DISCUSSION

This survey showed that the knowledge about forensic odontology among the dental professionals practicing in Tamil Nadu has increased but still in infancy stage compared to the rest of the world. The awareness and knowledge are better in cities such as Chennai and Coimbatore but less in other cities. However, the inclination to learn about forensic odontology and its application was very less because of very limited scope in India. Many of the dentists were not even aware of the National Association Indian Association Of Forensic Odontology (IAFO), and most of them did not know about any formal training courses in the field. Many of them were not aware and also not confident to testify as expert evidence in the court of law.

Almost half of the respondents knew about the study of lip prints. Cheiloscopy is the study of lip prints. Lip print patterns can guide us to important information and help in forensic identification of a person. Like the fingerprints used in human identification, the grooves present on human lips (sulci labiorum) are unique to each person and can be used to determine identity.[8]

Teeth found in skeletal remains can provide information about genetic origin, sex and age that help in identification of the deceased person. Molecular biology such as DNA analysis can help ascertaining the gender of the cadaver from the tooth remains.[6,7] DNA can be extracted from the pulp tissue, dentin, cementum, periodontal ligament and alveolar bone. The hard tissues of the teeth are resistant to environmental actions such as incineration, immersion, trauma or decomposition. In such cases, pulp tissue can be used as a source of DNA.[8]
### Table 1: Questionnaire survey assessing knowledge, attitude and awareness of forensic odontology among dental practitioners in Tamil Nadu

| Questions                                                                 | Response options                                                                 |
|---------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Knowledge                                                                 |                                                                                   |
| 1. What is the first step for the identification of unclaimed bodies?     | Fingerprinting                                                                    |
|                                                                            | Physical and anthropological examination                                          |
|                                                                            | Visual examination                                                                 |
|                                                                            | Serological and genetic DNA comparison                                            |
|                                                                            | Do not know                                                                        |
|                                                                            | Genetic origin                                                                     |
|                                                                            | Sex                                                                               |
|                                                                            | Age                                                                               |
|                                                                            | All the above                                                                       |
| 2. Teeth which are found in skeletal remains provide information of which of the following? | Cranial appearance                                                                 |
|                                                                            | Measurement of the tooth                                                           |
|                                                                            | Amelogenin secreted by the Ameloblasts of enamel                                   |
|                                                                            | All of the above                                                                   |
| 3. How do you estimate the dental age of an individual by examining the teeth? | Secondary dentin deposition                                                        |
| 4. How do you determine the sex of an individual from skeletal remains?   | DNA                                                                               |
|                                                                            | Cementum annulations                                                               |
|                                                                            | Enamel translucency                                                                 |
| 5. Which is mostly used to determine the age of a person from skeletal remains with teeth? | Yes                                                                               |
|                                                                            | No                                                                                |
| 6. As a dentist do you know any role of forensic odontology in mass disaster? | Agree                                                                            |
| 7. If yes, how will you identify the age and gender of the deceased in the event of a mass disaster? | Disagree                                                                          |
| 8. Can sex determination be done using Barr bodies?                       | Don’t know                                                                         |
| 9. How confident are you in giving an opinion on forensic odontology?     | Very confident                                                                     |
|                                                                            | Confident                                                                          |
|                                                                            | Not confident                                                                       |
|                                                                            | No idea                                                                            |
| 10. How can you identify physical/neglective/sexual/psychological abuse of a child? | Inform police                                                                      |
| 11. What would you do if you identify signs or symptoms of child abuse?   | Inform parents                                                                     |
|                                                                            | Inform NGOs                                                                        |
|                                                                            | Take no actions                                                                    |
|                                                                            | Mucosa                                                                            |
|                                                                            | Lips                                                                              |
|                                                                            | Tongue                                                                            |
|                                                                            | Bruises or scarring in corners of mouth                                           |
| 12. Which is the most common sight of injury a dentist can identify in case of abuse? | Yes                                                                               |
|                                                                            | No                                                                                |
| 13. Do you know the significance of bite mark patterns of teeth?          | Yes                                                                               |
|                                                                            | No                                                                                |
| Dental record maintenance                                                 |                                                                   |
| 14. Do you maintain dental records?                                       | Yes                                                                               |
| 15. What are the records you maintain and for how long?                   | No                                                                                |
|                                                                            | Patient details                                                                    |
|                                                                            | Photographs                                                                       |
|                                                                            | Medical history                                                                    |
|                                                                            | Study casts                                                                       |
|                                                                            | Family history                                                                    |
|                                                                            | Radiographs                                                                       |
|                                                                            | Clinical findings                                                                 |
|                                                                            | Investigation findings                                                             |
|                                                                            | Treatment plan                                                                     |
|                                                                            | Treatment log                                                                     |
|                                                                            | Yes                                                                               |
|                                                                            | No                                                                                |
| 16. Are you aware of the significance of maintaining dental records in identifying the deceased and crime suspects? | International Academy of Forensic Odontology                                      |
|                                                                            | Indian Association of Forensic Odontology                                          |
|                                                                            | Indian Academy of Forensic Odontology                                             |
|                                                                            | Lipology                                                                          |
|                                                                            | Cheiloscopy                                                                        |
|                                                                            | Laparoscopy                                                                        |
|                                                                            | Dermatoglyphics                                                                    |
| Awareness                                                                 |                                                                                   |
| 17. What is the full form of IAFO?                                       |                                                                                   |
| 18. Study of lip prints is called?                                       |                                                                                   |

Contd...
Age of a person can be estimated from dental hard tissue changes that progress with advancing age: occlusal wear, secondary and tertiary dentin layers, cementum thickness, the extent of root resorption, the length of the root, transparency and the height of gingival attachment.\textsuperscript{[9]} Seventy-eight percent of the respondents said that the most often used method for determination of age is secondary dentin deposition.

Dental health professionals have to be alert about a variety of physical and behavioral indicators to identify suspected child abuse. If the dentist suspects physical abuse with a child /young patient, then he or she should have another dental staff member to witness the injuries and also to assist in their documentation. The police should also be informed for better clarity.\textsuperscript{[10‑12]} Eighty percent of the respondents said that they would only inform parents if they identify a case of child abuse.

The identification of individuals in mass disasters is complex due to increased number of causalities and fraught with hazards, both physically and emotionally. A forensic anthropologist may be called in, when human remains are found during archaeological excavation, or when badly decomposed, burned or skeletonized remains are found by law enforcement or members of the public.\textsuperscript{[13]} Most of the dental practitioners in the study were not aware of the methods to identify the age and gender of the deceased individuals, which is where the most vital role of a forensic odontologist comes into play.

The most important role of practicing dentists in dental identification process is by developing and maintaining standards of record keeping,\textsuperscript{[14]} which would be valuable in restoring their patients. Twenty-two percent of the dental practitioners did not maintain dental records in their clinic. Among those who maintained, only 15% maintained complete dental records. Such maintenance of dental records was limited to a period of <5 years in majority of the clinics. Only 19% of the dentists who maintained dental records knew its significance in identification of crime suspects and deceased individuals. Poor quality of record maintenance indicates that the dentists in Tamil Nadu were not prepared for any kind of forensic and medicolegal need, if it arises.

Many of the respondents did not know the significance of bite marks. A bite mark may be defined as a mark having occurred as a result of either a physical alteration in a medium caused by the contact of teeth or a representative pattern left in an object or tissue by the dental structures of an animal or human.\textsuperscript{[15]} Most of the respondents felt that there are very limited resources in India in the specialization of forensic odontology.

**CONCLUSION**

This study, conducted among 252 dental practitioners in five cities in the state of Tamil Nadu regarding their knowledge and awareness about forensic odontology, revealed inadequate knowledge, poor attitude and lack of maintenance of dental records prevailing among dentists in the state.

This study shows that the branch of forensic odontology is still in the infant stage in the state. This condition, however, could be improved if more formal training courses are conducted by the specialist associations imparting knowledge and training in the field. Furthermore, scope of this specialty has to be established in evaluation of crimes by the government authorities. Further, steps are taken to make forensic odontology a part of our course. In addition, periodic conferences and seminars if conducted would help the dental practitioners and students enrich their knowledge about forensic odontology.

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**Conflicts of interest**

There are no conflicts of interest.

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