

Assessment of Knowledge, Attitude, and Practice in Forensic Dental Anatomy and Histology among Dental Practitioners

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Abstract

Dental anatomy and histology is one of the fundamental subjects and a key to comprehend the act of dentistry. Dental features such as tooth morphology and variations in shape and size play a vital role in the area of forensic odontology. Forensic odontology is a challenging field that involves the application of such knowledge of dental sciences in the identification of deceased individuals. The aim and objective was to assess and evaluate the knowledge, attitude, and practice regarding dental anatomy and histology in forensic investigation among dental practitioners. A cross-sectional survey was carried out among 217 dental practitioners from Maharashtra who in their day-to-day life may experience instances of forensic interest. The information was collected through telephonic interview by means of a pretested, close-ended questionnaire. In our study, the general awareness about forensic odontology was found to be more among MDS dental practitioners than BDS dental practitioners. Overall, there is a lack of adequate legal knowledge and forensic practices among the dentists of Mumbai and Nagpur. However, the practitioners did have a positive attitude toward the field and were keen to learn more about it. The study is the first of its kind to be conducted in Maharashtra state of India regarding dental anatomy and histology with respect to forensic odontology. The dental practitioners were also aware about the dental anatomy and dental histology with respect to forensic investigation.

Keywords: Anatomy, dental, dentist, forensic odontology, histology, teeth

INTRODUCTION

Forensic odontology is one of the captivating branches of forensic sciences that involve the utility of dental sciences in the identification of deceased individuals. According to Fédération Dentaire Internationale, forensic odontology is the branch of dentistry which in the interest of justice deals with the proper handling and examination of dental proof with the right assessment and presentation of dental findings.^[1] Forensic odontology specifically entails identification of the deceased individual via evaluating antemortem and postmortem facts while the deceased person is skeletonized, burned, dismembered, and mutilated in catastrophe or mass tragedies.^[2] Although forensic odontology has advanced as a new ray of hope in supporting forensic sciences, this area is still in a state of infancy in India.^[3]

Dental anatomy and histology are the most important topics studied by dental students when they begin their dental career. As every tooth has its own shape, structure, size, form, and unique feature, it has a role in the development of professionalism.^[2] Dental students are taught to correctly identify the variations in morphology of the teeth and

anatomical and functional variations in primary and permanent dentition. Apart from the clinical functions, the teeth also have a vital role in age estimation and sex determination.^[4] Thus, the dentist should be able to differentiate between the natural teeth and prosthesis and between human and nonhuman teeth. Forensic odontology is included only as a single chapter in one of the textbooks in the dental curriculum;^[5] thus, dental students have inadequate knowledge and insufficient expertise about the forensic implications of the teeth.

The question continually arises as to whether or not the dental practitioners ought to understand about forensic odontology, with the motive being that dental identification

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provides an accurate source of identification of the victim or the suspect. Moreover, natural and human-made disasters are occurring more frequently in India, thus putting the bodies of the victims beyond recognition, where the role of dental practitioners comes into the picture in the identification of such individuals.^[6] Hence, the present study was conducted to assess the knowledge, attitude, and practice of forensic dental anatomy and histology among dental practitioners in Mumbai and Nagpur cities of Maharashtra.

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted among randomly chosen 217 dental practitioners (107 males and 110 females) in Mumbai and Nagpur cities of Maharashtra. The study included those dental practitioners who were willing and available to participate. The questionnaire survey was conducted through telephonic interview.

The participants were informed of the study; the purpose and objective of the research and informed consent were also obtained.

The questions were close ended, and information was obtained from the demographic data of participants, which includes age, gender, and education level. The questionnaire was divided into three parts, namely knowledge, attitude, and practice.

- Basic knowledge of dental anatomy and histology in forensic caseworks
- Attitude of dentists toward forensic odontology practice
- Preferences of dentists as experts/forensic odontologists in the field of forensic odontology.

The questionnaire [Table 1] consisted of 15 questions of knowledge-based, attitude-based, and practice-based questions. The collected data were subjected to descriptive statistics using IBM SPSS Statistics, Version 22.0 (Armonk, NY, USA).

RESULTS

Majority of the study population were female (50.69%), had a qualification of BDS (53.91%), and were practicing for <5 years (78.34%) [Table 2].

In our study, 82.1% of the participants have taken an interest in learning dental anatomy and histology in detail during their dental school days, and about 7.3% of the participants were not interested in learning. It was also noted that 76.6% knew how dental anatomy help in tooth identification and establishing the identity of an individual, and about 23.4% were not aware of it.

It was observed that 94% knew how a dentist can estimate the chronological age of a patient by visualizing the teeth present in the oral cavity; however, 4.1% were not sure regarding the procedure for the same.

Only 43.1% of the participants have agreed to be taught about the comparative dental anatomy in the context of forensic identification during their undergraduation (UG)/postgraduation (PG) teaching scheme; rest 56.9% were not sure about it.

Eighty-three percent of the participants knew what odontometrics is, whereas 17% of the participants were not sure about the term. It was also noticed that only 67% of the participants knew how tooth size standards can be used in age estimation and sex determination. Approximately 90% of the participants observed the crown and root features after undergoing a tooth extraction.

When asked about dental histology, 76.6% of the participants knew how dental tissue such as enamel/dentin/cementum can act as an aid for the identification of age and 79.8% of the participants agreed on the reliability of enamel translucency/deposition of secondary dentin/cementum annulations methods to identify the age of the deceased.

About 72.5% of the participants stated that the teeth can serve as a source of DNA; however, 27.5% did not agree

Table 1: Questionnaire for survey

1. As a dental student, have you taken interest in learning dental anatomy and histology in detail?
2. Does dental anatomy help in tooth identification and establishing identity of an individual?
3. Can you estimate the chronological age of a patient by visualizing the teeth present in the oral cavity?
4. Have you been taught about the comparative dental anatomy in the context of forensic identification during your UG/PG?
5. Is odontometrics called the study of tooth measurement?
6. Can we use the tooth size standards in age estimation and sex determination?
7. While performing the tooth extraction, do you observe the crown and root features after extraction?
8. Can dental histological tissue such as enamel/dentin/cementum act as an aid for identification of age?
9. Are methods such as enamel translucency/deposition of secondary dentin/cementum annulations reliable to identify the age of the deceased?
10. Can teeth serve as a source of DNA?
11. Are you aware of PCR method used for identifying the genetic relationship between individuals?
12. Can sex determination be done using Barr bodies?
13. Are you aware about different crown and root traits in the context of dental anthropology?
14. Is the fracture or loss of tooth a grievous injury under IPC 320 Clause 7 (5)?
15. Are you aware that dentist can present dental evidence and testify as an expert witness in the court?

PCR: Polymerase chain reaction, IPC: Indian Penal Code, UG/PG: Undergraduation/postgraduation

Table 2: Demographic details

Variables	Frequency (n=217)	Percentage
Age	<30 years - 197	90.78
	>30 years - 20	9.22
Gender	Male - 107	49.31
	Female - 110	50.69
Qualification	BDS - 117	53.92
	MDS - 100	46.08
Experience	0-5 years - 170	78.34
	5-10 years - 30	13.83
	10-15 years - 17	7.83

for the same and 63.3% knew about the polymerase chain reaction method used for identifying the genetic relationship between individuals. It was also noted that 49.1% knew that sex determination can be done through Barr bodies. Nearly 75% of the MDS dental practitioners and 41% of the BDS dental practitioners knew sex determination using Barr bodies. Almost 51.8% were only aware of the different crown and root traits in the context of dental anthropology.

In the context of legal dentistry, it was observed that 21.6% of the participants only knew about the IPC 320 Clause 7 (5) Section, whereas 71.5% of the participants were not aware of the grievous injury. However, it was noticed that 77.5% were aware that the dentist can present dental evidence and testify as an expert witness in the court.

About 93% of the MDS dental practitioners and 84% of the BDS dental practitioners can estimate the chronological age of a patient by visualizing the teeth present in the oral cavity. The results of this study showed that dental practitioners had studied the dental anatomy in their curriculum but not in the context of forensic, which needs to be focused.

DISCUSSION

Forensic odontology plays a pivotal role in the identification of the person, as every individual has unique dental identification features and such is possible to be aware of through thorough adequate knowledge of dental anatomy.^[3] In decomposed, mutilated, burnt cases, fingerprints or DNA analysis would not be possible; in such cases, dental identification remains frugal or efficient than DNA analysis. The presence of features such as midline diastema, peg laterals, microdontia, macrodontia, spacing, and malocclusion can serve and support as positive identification.^[7] Thus, knowing dental anatomy thoroughly will ease the purpose of identification. Crown and root traits show significant changes for population differentiation and thus, help in identification.^[8]

Antemortem records in the form of dental records such as dental charting, dental casts, dental photographs, and radiographs play a role in positive identification.^[9] However, such data can be correctly interpreted if there is adequate knowledge of dental anatomy and dental histology, while doing comparison from local/national databases. In India, there are

no clear-cut guidelines or laws regarding the maintenance of the records. However, according to Medical Council of India regulations, 2002,^[10] every physician must maintain records for at least 3 years, as these records can be very helpful and an important source of information in cases of certain disasters for positive identification of an individual.

Odontometrics allows the determination of the sex and race^[8] to an extent as there are certain nonmetric traits specific to particular sex and race, for example, canines are wider and bulkier in males compared to females, the cusp of Carabelli is mostly seen in European population, while the presence of all the third molars is mostly evident in Negroid races. Class and individual characteristics such as approximate sizes of the arch and teeth, pattern and specific arrangements of teeth, spacing, malocclusion, rotation, malposition, or any other anomalies present in the teeth can serve as an important feature of identification in cases of bitemark identification and analysis as no two individuals have the same dental features.^[11]

Thorough knowledge of dental anatomy can also help us to differentiate between human and nonhuman specimens, as teeth can be identified by their class characteristics along with individual characteristics.^[12] Teeth are well protected within the oral cavity by external soft tissues;^[7] they also survive prolonged immersion, decomposition, desiccation, extensive trauma, and direct heat above 1000°F and serve as an excellent and an accurate source for DNA material^[13] if an adequate amount of teeth/pulp tissue/bone/buccal cells/saliva is present and if no other sources are available for DNA extraction.^[14]

Forensic odontologists who are associated with the age estimation/identification of the deceased and in some criminal investigations are usually summoned in the court of law to provide testimony as an “expert witness”;^[15] Nearly one-fourth of the participants were unaware of the fact that they could testify as an expert witness in court to present forensic evidence.

Few studies conducted at various cities in India such as Chennai,^[16] Pune,^[17] Bhubaneswar,^[18] Kanpur,^[19] and Ghaziabad^[20] also showed that there are inadequate exposure and awareness related to forensic odontology among the dental practitioners and dental students.

Although the practice of forensic odontology has gained importance in several countries such as Australia, the UK, Brazil, and Indonesia, in India, it is still in a state of infancy. Dental students need to be properly trained right from the 1st year of their dental career about the importance of dental records and how it can be a useful tool in forensic casework. In India, due to the efforts made by certain institutions and associations, forensic odontology is gaining momentum slowly.^[21] Moreover, dedicated conferences and workshops are organized in this domain for sensitization and development of the science.

This study is the first of its kind to be conducted in Western India concerning dental anatomy and histology with forensic investigation. It also provides evidence that there has been little change in the situation because other studies were conducted

in India and the awareness has increased, but it is still not to the extent as expected.

The study has several limitations such as inadequate undergraduate to postgraduate ratio and sample size. However, despite this, caution was taken to generalize the results and keep the survey unbiased. The questionnaire was designed for practicing dental practitioners, who might be encountering cases of forensic interest in their day-to-day life but due to the lack of proper knowledge of dental anatomy and dental histology might not know its significance.

CONCLUSION

The study states that thorough knowledge of dental anatomy and dental histology for dental practitioners will ease the process of forensic identification. Furthermore, it revealed that there is an adequate amount of knowledge regarding dental anatomy and dental histology to forensic odontology. However, dental practitioners were lacking in the legal aspects of forensic practices. This could be due to their busy dental practice, which does not allow them an opportunity to probe deeper into the forensic odontology. With the introduction of forensic odontology as a separate subject in the dental curriculum and formal training through workshops, the advent of forensic odontology will become bold in the coming years.

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Conflicts of interest

There are no conflicts of interest.

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