

Original Article

A Cross-Sectional Study to Assess Knowledge, Attitude, and Awareness of Forensic Odontology among Medical Students: An Emergency Concern

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ABSTRACT

Background: Medical professionals are important in treating and management of victims of mass disasters, abuse, and organized crimes. Although the forensic odontologist has a pivotal role in the investigation, health-care provider in the emergency medicine should have the potential to detect, inform, and interact with the dentist for further applications in legal issues. We aimed to conduct the present study on the knowledge, awareness, and attitude among the medical students.

Materials and Methods: With informed consent, we conducted a cross-sectional study among 194 4th-year medical students. A structured questionnaire consisting of 17 items relating to forensic odontology to assess the knowledge, awareness, and attitude among medical students and data were collected and reviewed.

Results: On analyzing the collected data of 194 participants, the percentage of participants who knew: the meaning of forensic odontology, forensic odontology a part of forensic medicine, and role of forensic odontology in the criminal analysis were 172 (87%), 192 (99%), and 181 (93%), respectively. A total of 183 (94%) were aware of bite mark patterns, 171 (88%) would examine for bite marks in child abuse, 89 (46%) the lip prints, DNA as accurate and sensitive method of comparison and teeth as source of DNA was 128 (66%) and 122 (63%), respectively. A total of 127 (65%) agreed that forensic odontologist as experts, 101 (52%) had opted for dental evidence, and 139 (72%) had agreed that postmortem unit should include a dental laboratory facility. However, only 79 (41%) knew the tooth as the choice of evidence in mass disaster. 101 (52%) stated dentist as expert witness. The awareness of the role of teeth in age and gender estimation was 147 (76%) and 79 (41%), respectively. Forty-nine (25%) had handled forensic dentistry case in emergency medicine and importance of maintaining dental records were known to 85 (44%).

Conclusions: Medical students had inadequate knowledge of forensic odontology. As a health-care provider, medical professionals should understand the implications of forensic odontology.

KEY WORDS: Age estimation, bite marks, dental evidence, dental records, DNA analysis, expert opinion, forensic medicine, forensic odontology, gender determination, medical students, postmortem unit

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INTRODUCTION

Forensic dentistry plays a major role in the identification of those individuals who cannot be identified visually or by other means.^[1] Forensic odontology is a fascinating specialized branch of dentistry related to solving legal problems. Dental evidence has significant application in identification of victims, suspects, and abused individuals.^[2] Dental identification has played a pivotal role and was first accepted by the court of law in the year 1849. The ante-mortem and post-mortem dental records assist in identification of the deceased through the human remains.^[3] Keiser-Neilson defined Forensic

odontology as “the branch of forensic medicine which deals with the proper handling, examination and presentation of dental evidence in the best interest of justice.”^[4]

Forensic medicine is a branch which deals with the application of medical knowledge in the judiciary system. It not only

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involves medico-legal autopsies and forensic pathology but also solving issues related to rape cases and domestic violence.^[5] Forensic medicine course is necessary in the field of health-care,^[6] and this fascinated branch eventually improves the knowledge and attitude of students.^[7] Furthermore, educating the undergraduate graduates about forensic medicine is extremely important.^[8,9]

Estimation of time of death is a very crucial concern in the field of forensic medicine. The accuracy of estimation may be affected by postmortem changes due to several factors. Hence, there is growing increase in various studies to establish time of death.^[10] Regrettably, most of the methods do not convene the necessity in practical application.^[11]

In conjunction with other health-care providers, dental professionals do come across cases of injuries for that may be non accidental.^[12] A dentist who is qualified in forensic science provides expert opinion in cases related to dental identification, analysis of bite mark, estimation of age, and other malpractices. Along with these, maintenance of dental records is a crucial role in investigation by a dental practitioner.^[13] Blood group antigen may also be determined by using teeth by a dentist.^[14]

The medical professionals are the first line of primary health-care providers in the emergency medicine department. They encounter a large number of medico-legal cases in the emergency medicine department. Cases such as victims of abuse, mass disasters, and other organized crime are treated and managed the emergency department. Although forensic odontology is establishing its significant role in crime scene investigations most of the health-care providers have insufficient knowledge about it. Active participation in routine investigations would be an added advantage in providing the knowledge and team work is necessary for a successful response. Although the forensic odontologist has a pivotal role in the investigation, health-care providers such as the medical care staff who are present as primary staff in the emergency medicine should have the potential to detect, inform, and interact with dentist for further applications in legal issues.

With this background, we aimed to conduct a study on the knowledge and attitude among the medical students.

MATERIALS AND METHODS

The survey comprised 4th-year medical students and medical interns, 194 in total. A structured questionnaire consisting of 17 questions [Table 1], of which seven were multiple choice questions and 10 were Yes/No options. With informed consent from all the participants, data were collected and analyzed. Sufficient time was given to fill the questionnaire while maintaining the confidentiality of the participants.

RESULTS

With 100% response from the participants, the data were collected and analyzed. On analyzing the collected data, we found about 172 (87%) students knew the meaning of forensic odontology. A total of 128 (66%) participants were aware that DNA comparison is the most accurate and sensitive method

to identify an individual. A total of 127 (65%) of them agreed that identification experts included forensic odontologists. About 101 (52%) had opted that along with other evidence collection, collecting dental evidence is also important. About 139 (72%) had agreed that postmortem unit should include a dental laboratory facility. Only 79 (41%) said that tooth is the choice of evidence collection in mass disasters.

About 192 (99%) agreed that forensic odontology is a part of forensic medicine. 181 (93%) knew forensic dentistry plays a role in victim/criminal analysis. About 101 (52%) were aware that court of law accepts the statement of a dentist as an expert witness. Only about 49 (25%) had handled forensic dentistry case in emergency medicine. The significance of maintaining dental records were known to only 85 (44%) participants. 183 (94%) were aware of bite mark patterns of teeth. 171 (88%) examine for bite marks in child abuse. Only 89 (46%) knew that lip prints could be presented as dental evidence. 147 (76%) were aware that forensic dentistry helps in age estimation. Using teeth, gender estimation could be done was known to only 79 (41%). 122 (63%) were aware that DNA analysis could be done using teeth.

DISCUSSION

Forensic dentistry involves the application of dental knowledge in the investigation of crime and administration of justice in the court of law. As educating forensic medicine is important for medical students,^[5] knowledge and awareness about forensic odontology is equally important.

The study was conducted to assess the knowledge, awareness, and attitude among medical students, as they are the primary health-care providers. The participants had better knowledge about awareness regarding the meaning of forensic odontology (87%), forensic odontology as a part of forensic medicine (99%), role of forensic dentistry in victim analysis (93%), bite mark patterns of teeth (94%), and examination for bite marks in child abuse (88%).

As teeth and jaws are impermeable to most types of injuries and also well protected from fire and other mechanical trauma, it may be implicated in human identification during mass disasters.^[15] When the deceased person is skeletonized, decomposed, burned, or dismembered, identification of dental remains plays a major role. The major advantage of teeth is it can be preserved after death and also teeth are highly durable that they can resist a temperature of 1600°C without loss microscopic structure.^[16] However in our study, we found only 41% would prefer dental evidence collection in mass disasters.

The best method for gender identification is DNA analysis, as morphological patterns vary with external factors and with time. The extracted DNA from the teeth of an unidentified individual may be compared with the antemortem DNA samples.^[17] Though DNA comparison is the most accurate and sensitive method to identify an individual, only 66% were aware and 63% knew that DNA analysis could be done using teeth. Knowledge and awareness about teeth as an excellent source for DNA extraction was inadequate among the participants.

Table 1: Questionnaire and Results

Questions (optional)	Overall - 194 (100%)	Questions (yes/no) options	Overall - 194 (100%)
1. Forensic odontology means a. Forensic science that deals with tooth b. Forensic science that deals with poison cases c. Forensic science that deals with human skeletal remains d. Forensic science that deals with determining the time of death	172 (87%)	7. Is forensic dentistry/odontology is a part of forensic medicine (yes/no)	192 (99%)
2. Which of the following is the most accurate and sensitive method to identify an individual? a. Visual identification b. Finger prints c. Physical anthropological examination of bones and teeth d. Serological comparison e. DNA comparison	128 (66%)	8. Do you know forensic dentistry plays a role in victim/criminal analysis (yes/no)	181 (93%)
3. The identification experts are a. Crime investigative officers, biologists, forensic odontologists, forensic science expert b. Medical officers, crime investigative officers, fingerprint experts c. Crime investigative officer, biologist, forensic science expert d. Biologist, finger print expert, medical officer	127 (65%)	9. Are you aware court of law accepts the statement of dentist as an expert witness involving civil and criminal cases (yes/no)	101 (52%)
4. Accurate identification methods involves the collection of a. Internal examination, e.g., medical evidence, dental evidence and laboratory findings b. Matching antemortem and postmortem evidence c. Circumstantial evidence like clothing, jewelry, and pocket contents d. Medical examination with post mortem reports	101 (52%)	10. Have you handled any forensic dentistry case in emergency medicine (yes/no)	49 (25%)
5. The post mortem unit consists of a. Postmortem medical unit with dental laboratory facility b. Body examination unit c. Postmortem finger printing unit d. Postmortem dental examination unit	139 (72%)	11. Are you aware of the significance of maintaining dental records in identifying the deceased and crime suspects? (yes/no)	85 (44%)
6. Choice of evidence collection in mass disaster? a. Any dental prosthesis b. Skull c. Tooth d. Jewelry	79 (41%)	12. Are you aware of the bite mark patterns of teeth? (yes/no)	183 (94%)
		13. Do you examine for bite marks in child abuse? (yes/no)	171 (88%)
		14. Are you aware that the lip prints for presenting dental evidence (yes/no)	89 (46%)
		15. Are you aware forensic dentistry helps in age estimation (yes/no)	147 (46%)
		16. Are you aware gender estimation can be done using teeth (yes/no)	79 (41%)
		17. Do you know DNA analysis can be done using teeth (yes/no)	122 (63%)

Bite mark analysis helps in identification of an individual.^[1] Teeth may be used as a weapon and may leave the mark of a

biter. Bite mark registration plays a pivotal role in the forensic field. In our study, 94% were aware of bite mark patterns,

88% agreed they would examine for bite marks in child abuse.

Although the knowledge about the inclusion of forensic odontologists along with other identification experts and postmortem unit consisting of dental laboratory facility was 65% and 72%, respectively, only 52% opted for collecting dental evidence. Insufficient knowledge about the determination of gender using teeth (41%) and lip print presentation as dental evidence (46%) was observed in our study. We also found that only 52% were aware that court of law accepts the statement of the dentist as an expert witness.

Age estimation is crucial in establishing the distinctiveness of an individual as the development of human dentition follows a consistent developmental sequence starting from 4 months *in utero* until the emergence of third molars, i.e., second to third decade of life.^[18] In our study, awareness about the estimation of age using teeth was 76%, which is inadequate.

The dental record provides the continuity of care for the patient and is crucial in the incident of any unethical insurance claim. Dental records are also useful in identification of a deceased by comparing ante-mortem and post-mortem reports.^[19] In our study, only 44% of participants were about the significance of maintaining dental records.

The overall result of our study was inadequate knowledge, awareness, and attitude about forensic odontology among the medical students. The reason for this could be lack of handling of forensic dentistry cases in emergency medicine department (25%).

CONCLUSIONS

Multiple scientific and allied services are necessary to the forensic field. Medical care professional should be given a basic training in forensic odontology, to assist a dentist in the presentation of evidence for the detection and solution of crime or in civil proceedings. A medical care staff should possess the skill to understand the forensic implications. It is mandatory to report any instance of human abuse to the proper authorities in most jurisdictions.

Further research work on large scale basis is required for evaluation of awareness, knowledge, and attitude among medical professionals. Medical students should also be included in periodic conferences and seminars conducted in forensic odontology which would improve their knowledge. Workshops may be conducted so that the practical skill would be developed in handling forensic odontology related cases in emergency department.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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