

Awareness of Forensic Odontology among Dental Professionals in Saudi Arabia: A Systematic Review

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Abstract-

Background- Forensic odontology has an important role in the recognition of abuse among persons of all ages. Dental professionals have a major role to play in keeping accurate dental records and providing all necessary information so that legal authorities may recognize malpractice, negligence, fraud or abuse, and identify unknown humans.

Aim- The present, review was conducted to assess knowledge and awareness of forensic odontology among dental professionals in Saudi Arabia.

Methodology- A review of relevant cross-sectional descriptive and observational studies was conducted regarding the level of awareness and knowledge of forensic odontology among dentists and dental students. The retraction of data in this study was undertaken from June 2013 to October 2021. Five out of 20 were included and 15 were excluded from the studies in Saudi Arabia in the present review after conducting a search of both electronic and manual scientific databases.

Results- Dental age estimation methods were known to 85.9% of dental practitioners. However, only 50% of the dental students were aware of it. Only 25% of the dental students were aware of the child abuse cases, as compared to the findings of another study that revealed 58.1% of knowledge among dental practitioners. About 87.5% of the dental students were aware of bite marks and 20% of about lip prints. About 97.5 % of the dental students revealed that forensic dentistry was not included in their undergraduate curriculum.

Conclusion- The overall, knowledge and awareness level of dental professionals was inadequate. However, dental practitioners were reported to have more knowledge and awareness and adequate practice compared to dental students on certain aspects such as dental age estimation, lip print identification, child abuse cases identification and dental record maintenance.

Key words- Dental professional, forensic odontology, dental students, Saudi Arabia.

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Introduction:

The term “forensic” is derived from the Latin word forensic, which means, “pertaining to the forum,” which means “court of law”, where trials and debates were held. Odontology refers to the study of teeth. Forensic odontology so has been defined by the Federation Dentaire International as that branch of dentistry, which in the interest of justice, deals with the proper handling and examination of dental evidence and the proper evaluation and preservation of dental findings.¹

Forensic odontology is a specialized field of dentistry related to legal problems Forensic dentistry involves the processing, review, evaluation and presentation of dental evidence with the purpose of contributing scientific and objective data in legal processes. Forensic odontology embraces all dental specialties and forensic dental fieldwork requires an interdisciplinary knowledge of all dental specialties.² There are five popular universities in Saudi Arabia that provide forensic sciences department. They are King Saud University in Riyadh; King Abdul Aziz University in Jeddah; Imam Abdul Rahman Bin Faisal University in Dammam; Taif University in Taif, Naif Arab University for security forces (NAUSS) in Riyadh, Saudi Arabia.

A study³ reported in the year 2007, The Arab Society for Forensic Sciences and Forensic Medicine (ASFSSFM) in association with NAUSS organized and hosted the first international forensic science and forensic medicine conference in Riyadh, Kingdom of Saudi Arabia. Introduction to Forensic Medicine was founded in the year 2014. NAUSS and offered academic and professional assistance to institutes, colleges, universities, law enforcement/ planning agencies and other professional bodies to develop and improve programs and curricula related to forensic sciences, forensic medicine and security.

In one of the study⁴; about teaching of forensic medicine undergraduate levels in medical colleges in Saudi Arabia, it was reported that out of 27 universities, only 16 (59.26%) teach forensic medicine to undergraduate medical students, and 11 (40.74%) do not teach forensic medicine in their undergraduate curriculum and had no faculty or department of forensic medicine. Similarly, forensic dentistry is not included in the curriculum of undergraduate dental students in private and government dental institutions in Saudi Arabia.^{5,6} Therefore, the present systematic review was conducted on the available literature to report on Knowledge and awareness of forensic odontology among dental professionals, which includes dental students and dental practitioners in Saudi Arabia.

Materials and Methods

Study Design

This present systematic review was carried out with a search in the literature that included original full text articles, cross-sectional, observational, descriptive studies, published until October 2021, which evaluated the knowledge and awareness of forensic odontology among dental students and dental practioners working in private and government sectors of Saudi Arabia.

The study participants were informed about the research's purpose and objectives, and informed consent was obtained. The study was registered with the research center of Riyadh Elm University with registration number "FRP/2021/379/594/565"

Search Strategy

The present systematic review of literature was carried out both electronically as well as manually. The relevant literature search was carried out through searches of the digitized literature on MEDLINE, EMBASE, PubMed databases, and manual search irrespective of the date of publication using Medical Subject Headings (MeSH) terms- “forensic odontology,” “forensic dentistry”. A total of 30 papers were identified with this method. Various key words utilized in the search strategy included such as forensic odontology, knowledge, practice, awareness, dentists, dental students, dental practitioner. Experts in the concerned field and authors of selected studies were also contacted for

obtaining missing or unclear data whenever deemed essential.

Selection Criteria

Initially, titles and abstracts of the records retrieved by the search were assessed in order to exclude those studies that were inappropriate. Reviews were not included. For the remaining studies, full text articles were recovered that met the inclusion criteria. Selected studies were screened using the STROBE checklist for observational studies.⁷

Inclusion criteria: Study selection was based on the following: (1) Studies conducted in Saudi Arabia and published until October 2021 (2) subjects limited to dental professionals such as dental students and dental practitioners working in private and government sectors in Saudi Arabia (3) full text articles published in the English language (4) studies evaluating the knowledge and awareness of forensic odontology as outcome measures and (5) cross-sectional, observational studies and review articles of dental students and dental practitioners.

Exclusion criteria: The studies that were excluded from the present review were: (1) Studies not from Saudi Arabia (2) Studies published before June 2013 (3) studies published in other than English language (4) articles having only titles, conference abstracts, case-control and retrospective data studies (5) studies not related to dental professionals.

Control of bias assessment

The following issues were included in the risk of bias or quality assessment in the present systematic review: (1) Completeness of article information on forensic dentistry (2) selective outcome reporting (3) outcome measures (knowledge or awareness levels, and practice of forensic odontology (4) study design and (5) conflict of interest in the conduct of the study.

Collection and Data Extraction

The data were extracted from each of the studies including the study design, sample type, and practices regarding forensic odontology among the study subjects, awareness and knowledge of forensic odontology. All authors analyzed the selected studies and critically reviewed the main findings. This review was done according to the guidelines set forth by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).⁸

Results

Study Selection and characteristics

The search retrieved 30 articles. After removal of duplicates, 20 articles remained. A comprehensive evaluation of the titles, abstracts resulted in exclusion of 15 articles and five studies^{5,6,9,10,11} were potentially eligible for the present review after performing the necessary exclusions^{12-15,16-18,19-22,23,24,25,26,27}. The reason for exclusion was due to incomplete articles, reviews, conference abstracts, articles in other than English language, retrospective studies, qualitative studies and case-control studies.

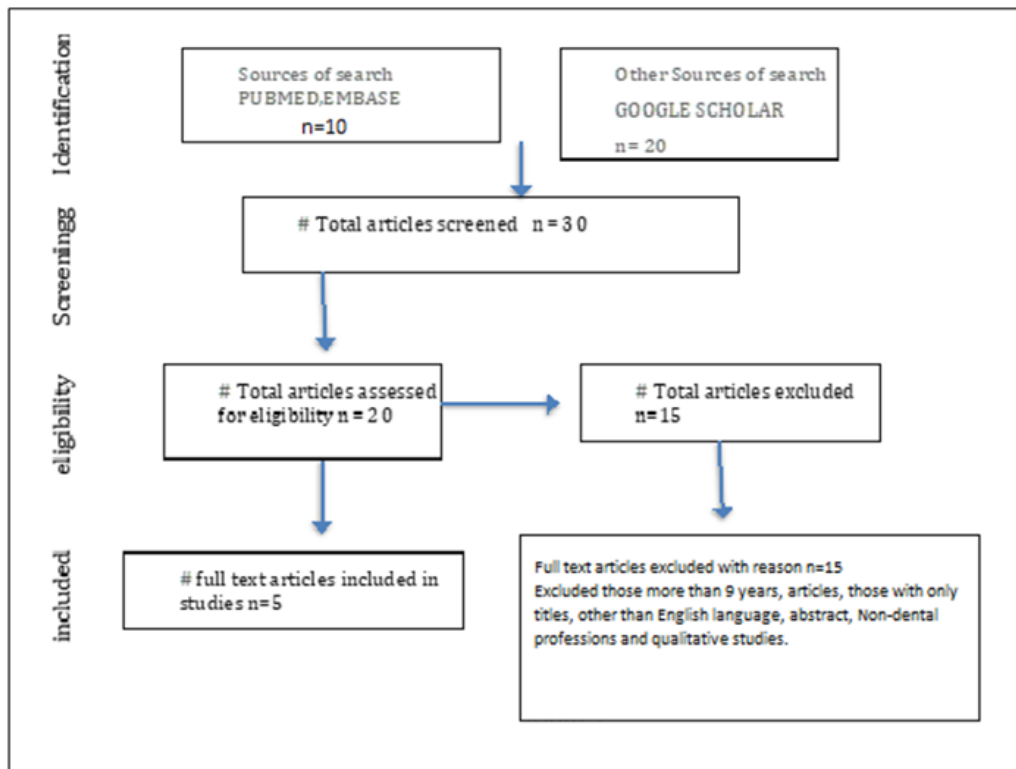


Figure 1: Data search of review

In the studies that are included in the present systematic review belonged to different regions of the country. All the five studies were conducted in different regions of Saudi Arabia (Three studies in Riyadh region and two in Dammam region). All the studies were related to dental students and dentists and used a close or open-ended questionnaire for gathering the relevant data regarding forensic odontology from the study subjects.

The study population in three of the studies comprised entirely of dental practitioners working in either private or government sectors, one study comprised of participants from private, government and academic sectors. However, one study was conducted in the academic university among dental students.

Table 1: Study characteristics on forensic odontology included in the review

Authors	Year of publication	Study Population	Sample size	Study Setting	Study region	Study Objective	Results
Al Sheddi M et.al ¹⁰	2015	Dentists working in Academic, private and government sectors	248	Cross-sectional	Riyadh, Saudi Arabia (SA)	Awareness of the scope and practice of forensic dentistry	Inadequate awareness and practice of Forensic dentistry (FD) among the subjects due to lack of forensic training and education in the dental curriculum.

Al Khalaf et.al. ⁶	2017	Dental practitioners (working in private and government sectors)	323	Cross sectional, descriptive study	Dammam, SA	Knowledge and practice of forensic dentistry	Inadequate knowledge and practice of forensic dentistry among government practitioners than private in the aspects of maintaining dental records and bite mark identification
Al Mutairi AF et. al. ⁹	2018	Dental practitioners (working in private and government sectors)	360	Cross sectional study	Riyadh, SA		The level of knowledge about forensic odontology among the study subjects moderate to low. The gap between the perceived and actual knowledge signifies a low self-confidence in the personal knowledge on this aspect.
Abdul NS et.al. ⁵	2019	Dental students (Academic)	400	Cross sectional study	Riyadh, SA	Knowledge, Awareness, Attitude and Practice of forensic odontology	Inadequate knowledge, poor attitude and lack of practice among the study subjects due to lack of forensic in the dental curriculum
Nazir MA et.al. ¹¹	2019	Dentists working in private and government sectors	323	Cross sectional study	Dammam, SA		The study found that the dentists who received FD training had greater chances of having FD

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Result Synthesis

Knowledge and Awareness of forensic odontology among dental practitioners and dental students:

Knowledge about dental age estimation methods was known to majority of dental practioners (85.9%) in the studies reported by some authors^{6,9} in Saudi Arabia. Whereas, only 50% of the participants were aware in one of the study conducted among dental students.⁵

It was found that 64.5% of the participants were able to identify bite mark patterns and child abuse cases. Knowledge about bite marks (85.6%), lip prints identification (45.3%) and tooth as source of DNA (64.2%) was known to majority of the participants. Whereas, child abuse cases was known to only 58.1% of the dental practioners.⁹

The reported data from the study conducted by Abdul NS et.al.,2019⁵ in dental students; was found that, 87.5% were aware of bite mark identification and 20% about lip prints and 25% about child abuse cases.

Internet was the source of knowledge for 75% of the dental students⁵, compared to 20.5% of dental practioners in one of the studies.⁶Child abuses cases were not suspected by 88.3% of the dentists in their clinic and only 37.1% agreed that they would report such cases to the police if they find suspected cases.¹⁰

About 73% of the dental practitioners reported inadequate knowledge of forensic dentistry⁶. About 93.2% undergraduate and 83.4% graduate dental students agreed that they lack knowledge about forensic dentistry.⁵

Practice of forensic odontology among dental practitioners and dental students:

Dental records serve as a very valuable tool in forensic odontology as they can reveal important information like name, age, sex, number of teeth present, dentures, and other restorations of deceased persons or victims.

The Dental records were maintained by 88.5% and 87.5% of the study participants in few studies in literature^{11,6,5}.This was disagreed by a study reported by Al Sheddi M et.al.,¹⁰ which showed only 44%.Very few dentists had prior experience in solving cases related to forensic odontology in all the studies. It was found that only, 30.3% of the dentists received formal training in forensic dentistry.²⁸ whereas, 58.10% and 42.9% of the participants had not received any formal forensic training in their undergraduate levels.^{6,10} . About 78.7 % of the dental students were not interested and refused to get involved in court to provide forensic evidence, only 5 % of the participants appeared in court to provide forensic evidence. Majority (97.2%) refused.⁵About 97.5 % of the dental students revealed that forensic dentistry was not included in the undergraduate curriculum and were willing to participate in the education programs and workshops .¹⁰

Discussion

The focus of the present systematic review was on the knowledge, awareness, and practice of forensic odontology among dental practitioners and dental students in Saudi Arabia. The knowledge and awareness level regarding forensic odontology among the subjects is inadequate and there is significant variation in practice and management in different studies, which could be a contributed to the difference in sample size and to the different study settings. Five studies used open and close-ended questionnaire to gather information about various aspects of forensic odontology from their study subjects^(5,6,9,10,28). It can be seen from the results that almost majority of the subjects in one of the study⁵ had adequate knowledge regarding bite marks and dental records maintenance, compared to other studies. This could be due to the reason that majority of them were aware of forensic dentistry through Internet.

However, the dentists in other study depended upon the newspaper.²⁹

There is a need for maintaining dental records officially and professionally to protect against any medico-legal litigation. In the study conducted by Al Khalaf AH et.al., 2017⁶ and Ali A et.al., 2016³⁰; it was revealed that 88.5% and 87% of the participants maintained dental records. Australian-based studies by Al-Azri AR et.al., 2016¹³ had revealed that the dental records of forensic significance were not recorded.

Knowledge about bite marks was found to be adequate among postgraduates than the undergraduates in the study by Abdul NS et.al., 2019⁵. In studies by Rahman J et.al., 2017³¹ similar results were reported³⁰. In the studies by Preethi S et.al., 2011³² revealed that the knowledge about bite marks was not known to 18% of the dental practitioners. Whereas, in the study conducted by Nagarajappa R et.al., 2014²⁸ about 71.4% of the participants were aware of lip prints. However, inadequate knowledge and practice was revealed among Nigerian dental practitioners.³³ According to studies; cases related to child abuse in metros were less than in tier-2 cities^{34,29}. Only 4% of subjects reported to have contributed to the identification of victims in mass disasters³² and approximately the same percentage of subjects had contributed toward solving cases related to forensic odontology in the study reports of Khare P et.al., 2013²⁹. Only 7% of study participants were exposed to formal training in forensic odontology in the study reports of Shetty P et.al., 2011³⁵. The findings of the study conducted by Preethi S et.al.,³² reported that 40% of dental practitioners did not have the expertise to identify child abuse and the remaining 60% would identify by physical injury, scars, behavior and clothing. About 79% of dentists maintained dental records³². Only 12% of dentists maintained complete dental records in one of the study reports³³. Therefore, it calls for the social responsibility of each dentist to main complete dental records of their clients that can serve as an important source of information in the event of any mishap.

The concerned dental council like other dental specialties to enable practitioners to specialize in the subject should introduce forensic odontology courses as a separate course.³⁶ It is possible that some relevant data may have been omitted in terms of fugitive literature (conference proceedings, dissertations and studies in other languages. This could have accounted for some publication bias and any important information would undoubtedly have been overlooked given the type of literature search strategy used to conduct the present review.

Limitations of the study

A limitation of this study is that it is a small sample of all retracted records and study was confined to a sample of dental professionals, which included dental practitioners and dental students only from the central and eastern provinces of Saudi Arabia.

Recommendations:

1. Recommend the government and private health care sectors to conduct workshops, seminars, and continuing dental education programs for postgraduates to bring awareness among all health-care providers the significance of forensic odontology in the society.
2. Introduction of forensic dentistry in the undergraduate curriculum.
3. Formal training programs should be initiated in educational institutions.

Conclusion:

The knowledge and awareness level of the dental practioners and dental students was inadequate, with considerably low attitude and practice scores. In Saudi Arabia, there is lack of exposure to this branch of science, as it is not included in the dental curriculum for undergraduate courses.

References:

1. Acharya AB, Sivapathasundharam B. Forensic odontology. In: Rajendran R, Sivapathasundharam B (eds.). Shafer's Textbook of Oral Pathology. 8th ed. India, Elsevier Publication; 2017. p716-39
2. Shamim T. Forensic Odontology. Journal of the College of Physicians and Surgeons Pakistan 2012;22(4):240-245.

3. Ghaleb SS . 2014. The Arab Society for Forensic Sciences and Forensic Medicine (ASFSSFM): Bringing together regional and international expertise..Arab journal of Forensic Sciences and Forensic Medicine 2014;1(0):17-25.
4. Madadin M, Al-Saif DM, Khamis A.H, Taha AZ, Kharoshah MA, Alsayyah A et al . Undergraduate teaching of forensic medicine in Saudi Arabia. Med Sci Law 2016;56(3):163-166.
5. Abdul NS, Alhazani L, Alruwail R, Aldres S, Asil S. Awareness of forensic odontology among undergraduate, graduate, and postgraduate dental students in Riyadh, Saudi Arabia: A knowledge, attitude, and practice-based study. J Forensic Dent Sci 2019;11:35-41.
6. Al Khalaf AH, Al Nahawi DE, Al Naser HH, Nazir MA. 2017. The knowledge and practice of forensic dentistry among dental practitioners in the Eastern Province, Saudi Arabia. Int J Adv Res. 5:1971-1978.
7. STROBE Statement. Strengthening the Reporting of Observational Studies in Epidemiology Switzerland; 2007. Available from: <https://www.strobe-statement.org/index>. (assessed on:???)
8. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Getzsche PC, Ioannidis JPA et.al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions. Explanation and elaboration. Journal of Clinical Epidemiology 2009;62:e1-e34.
9. Al Mutairi AF, Khtheri BA, Aleidan HN, Alhabib AA, Alotaibi EA, Salam M. Examining the perceived versus actual knowledge about forensic odontology: A cross-sectional survey among dentists. Clin Exp Dent Res 2018;4:297-304.
10. Sheddi M Al, Asiri A Al. Awareness of the scope and practice of forensic dentistry among dental practitioners. Australian journal of forensic sciences 2015;47(2):194-199.
11. Nazir MA, Al-Ansari A, Al-Khalifa K, Gaffar BO. Determinants of knowledge and practice of forensic dentistry among dental practitioners. European Journal of Dental Education 2019;23(4): 491-497.
12. Alassiry A 'Alshomrani K, Hasi S Al, Albasri A, Alkathami SS, Althobaiti MA. . Dental age assessment of 3-15-year-old Saudi children and adolescents using Demirjian's method—A radiographic study. Clin Exp Dent Res 2019;5:336-342.
13. Al-Azri AR, Harford J, James H. Awareness of forensic odontology among dentists in Australia: Are they keeping forensically valuable dental records? Australian Dental Journal 2016; 61:102-108.
14. Al-Dharrab AA, Al-Sulaimani FF, Bamashmous MS, Baeshen HA, Zawawi KH. Radiographic evaluation of dental age maturity in 3-17-years-old Saudi children as an indicator of chronological age. J Orthodont Sci 2017;6:47-53.
15. Alfawzan AA. Gonial Angle as a Determinant of Gender, a Panoramic Study in a Sample of Saudi Population. Indian Journal of Public Health Research & Development 2020;11(1):1689-1693.
16. AlMutairi S. 2013. Forensic science services in the kingdom of Saudi Arabia: Achievements and challenges. Law and justice Rev.2013;4(1):103-119.
17. AlQahtani S, AlShahrani Y, Alqahtani A..Reality of forensic odontology in Saudi Arabia. Rev Bras Odontol Leg RBOL 2017;4(2):12-21.
18. Alqerban A , Alrashed M, Alaskar Z' Alqahtani K.Age estimation based on Willems method versus country specific model in Saudi Arabia children and adolescents. BMC Oral Health 2021;21(341):1-9.
19. Alshihri AM, Kruger E, Tennant M. Western Saudi adolescent age estimation utilizing third molar development. European Journal of Dentistry 2014;8(3): 296-301.
20. Alshihri AM, Kruger E, Tennant M. Dental age assessment of 4-16 years old western Saudi children and adolescents using Demirjian's method for forensic dentistry. Egyptian J forensic sciences 2016;6:152-156.
21. Ashraf S, Mathew VB, Masaad F, Shamsuddin SV, Kunjappu JJ, Alotaibi AN. Comparison of the accuracy of age estimation methods on Saudi Arabian population - a cross sectional study. Journal of Evolution of Medical and Dental Sciences 2020; 9(37):2717- 2721.
22. Baghdadi ZD.Dental maturity of Saudi children: Role of ethnicity in age determination. Imaging Science in Dentistry 2013; 43(4): 267-272.

23. Aboalshamat KT, Alghamdi DS, Almaqboul FA, Almarhabi DA, Aleissa H, Alattas T, Aqely AA, Albishry RN. Knowledge and Attitudes of the Public in Saudi Arabia about Forensic Odontology during COVID-19. *J. Res. Med. Dent. Sci* 2021; 9(9):107-115.
24. Nagarajappa AK, Alruwaili MG, Alrubiash AAA, Alam MK. Adult Age Estimation from Dental Pulp in Jouf Population: A Digital Radiographic Study. *World J Dent* 2018;9(6):476-480.
25. Salam M, Al-Rawashdeh N, Almutairi AF. 2020.Public awareness of forensic odontology and willingness to enroll in a prospective dental registry: A survey conducted in Saudi Arabia. *The Saudi Dental Journal* 2020;32(1):21-28.
26. Souror YR, Gharote HP. Reliability of two dental age estimation methods in children and comparison with their chronological age. *Saudi J Health Sci* 2019;8(3):133-6.
27. Yassin SM. Accuracy of Demirjian's four methods of dental age estimation in a sample of Saudi Arabian population. *Australian Journal of Forensic Sciences* 2020;1-14. Available on: <https://doi.org/10.1080/00450618.2020.1766110>
28. Nagarajappa R, Mehta M, Shukla N, Tuteja JS, BhallaA. 2014.Awareness of forensic odontology among dental practitioners in Kanpur city, India: A Kap study. *J Dent Res Updates*.1:6-12.
29. Khare P, Chandra S, Raj V, Verma P, Subha G, Khare A. Status of forensic odontology in metro and in tier 2 city in urban India. *Journal of Forensic Dental Sciences* 2013;5(2):134-137.
30. Ali A, Sardar K P, Nasir S, Wakar SM. Knowledge, attitude and practice of forensic odontology among graduates and postgraduates at Dow University of health sciences (DUHS). *J Pak Dent Assoc*2016;25(3):110-114.
31. Rahman J, Routray S, Mishra SS, Mohanty I, Mohanty N, Sukla N. Knowledge, awareness, and practice of forensic odontology among dental surgeons in Bhubaneswar, India. *J Unexplored Med Data* 2017;2:26-33.
32. Preethi S, Einstein A, Sivapathasundharam B.Awareness of forensic odontology among dental practitioners in Chennai: A knowledge, attitude and practice study. *Journal of Forensic Dental Sciences* 2011;3(2):63-66.
33. Ugbodaga PI, Egbor PE, Okoh DS.. Awareness of forensic odontology among Nigerian dentists: A knowledge, attitude and practice study. *AFRI J Oral Maxillofac Path Med* 2015;1(1):51-57.
34. Sengupta S, Sharma V, Gupta V, Vij H, Vij R, Prabhat K. Forensic odontology as a victim identification tool in mass disasters: A feasibility study in the Indian scenario. *Journal of Forensic Dental Sciences* 2014;6(1):58-61.
35. Shetty P, Raviprakash A. Forensic odontology in India, an oral pathologist's perspective. *J Forensic Dent Sci* 2011;3(1):23-6
36. Hermsen KP, Johnson JD. A model for forensic dental education in the predoctoral dental school curriculum. *J Dent Educ* 2012;76:553-61.