RESEARCH ARTICLE   OPEN ACCESS

Awareness of Forensic Odontology Among Dental Practitioners in Lucknow : A Knowledge, Attitude, Practice Study

Dr. Saundarya Priyadarshini: Post graduate student, Dept of Public Health Dentistry, BBDCODS, Lucknow. UP

Dr. Anuradha P: Prof & Head, Dept of Public Health Dentistry, BBDCODS. Lucknow. UP

Dr. Sugandha Agarwal, Senior lecturer, Dept of Public Health Dentistry, BBDCODS, Lucknow. UP

Dr. Swati Sharma: Associate Prof & Head, School of Dental Science, Sharda University< Greater Noida, UP

ABSTRACT

Introduction

The word forensic is derived from the ancient Roman "forum" the home of the law courts – and means "relating to the law." Forensic odontology is the application of dental science to legal investigations, primarily involving the identification of the offender by comparing dental records to a bite mark left on the victim or at the scene, or identification of human remains based on dental records. The aim of this survey was to assess the knowledge and practice of forensic odontology among dental practitioners (both those with BDS and MDS qualifications) and interns in Lucknow in India. Dentists with BDS and MDS qualifications irrespective of their specialty were included in the study.

Methodology

A cross sectional study was conducted using a 11-variable questionnaire for 2 months.variables assessed were, (questionnaire is added) 5 knowledge based, 3 attitude based and 3 based on practice. Descriptive statistics and chi square test was applied.

Result

Out of 288 dentist the respondant rate was 100%. It was observed that 96.5% dentist maintain dental records.

Conclusion

The study participants showed good knowledge regarding maintenance of dental records and association with MDS

INTRODUCTION

The word forensic is derived from the ancient Roman "forum" the home of the law courts – and means "relating to the law." Forensic odontology is the application of dental science to legal investigations, primarily involving the identification of the offender by comparing dental records to a bite mark left on the victim or at the scene, or identification of human remains based on dental records[1]

The first forensic identification in India started in 1193 were Jai Chand, a great Indian monarchy was destroyed by Muhammad's army and Jai Chand, Raja of Kanauji was murdered and he was identified by his false teeth.[2]

Lip prints can be used in the verification of presence or absence of the person at the scene of the crime. Wrinkles and grooves seen on the labial mucosa forms a pattern called sulci labriorum. The study of lip prints is known as cheiloscopy[3]

Sex determination analysis can be done either by morphological analysis or by molecular analysis.Morphological analysis can be done on hard tissues (odontometric, orthometric, and miscellaneous) of oral and paraoral regions or soft tissue (lip prints-Cheiloscopy, palatal rugae pattern-Rugoscopy)[4]

The identification of a person is required when the body is disfigured or mutilated beyond recognition as a result of barbaric crimes, motor vehicle accidents, aviation and navy disasters, wars, fire, flood, manmade and natural mass disasters and when the body is in unrecognizable, decomposed state.[5] In such situations, forensic anthropology, fingerprinting, forensic odontology (FO), radiology and DNA typing can be used for victim identification.[6] The identification of a person by means of dental identification is one of the most reliable methods as teeth and dental structures may survive postmortem (PM).[7]

India, the awareness of FO is gaining pace since the last decade after the establishment of various organizations and the Dental Council of India making it a part of the curriculum. However, its identity as an individual endeavour is still to be established. Although the Indian Dental Association[8] recommends that an individual's dental records (radiographs, models, photographs, and clinical correspondence) should be securely retained for at least the legal minimum period of 5-6 years, the practice is yet to be enforced in all dental practices across India.[8]

The question always arises as to whether the dental practitioners should know about forensic odontology, the reason being that dental identification provides an accurate source of identification of the victim or the suspect. In recent times, natural and man-made disasters are occurring more frequently in India. Under these conditions, the bodies of the victims become mutilated beyond recognition, where the vital role of dental surgeons comes into picture in the identification of such individuals.[9]

studies have been conducted over the last decade on knowledge and awareness of forensic odontology using validated questionnaires in Indian cities such as Chennai4,10 Pune,11 Kanpur,[10,11] Ghaziabad,[12,13] Kashmir,[14] and the Delhi National Capital Region[15] (which are in northern, western, and southern India). Most of these studies provided evidence that there were inadequate levels of knowledge and awareness of forensic odontology among the respondents.

Accordingly, considering the importance of the topic, the aim of this survey was to assess the knowledge and practice of forensic odontology among dental practitioners (both those with BDS and MDS qualifications) and interns in Lucknow in India. Dentists with BDS and MDS qualifications irrespective of their specialty were included in the study.

METHODOLOGY

A Cross-Sectional, questionnaire study was conducted to evaluate the dental practitioners' knowledge regarding forensic odontology. The study population consisted of private practicing dentists in Lucknow city during March 2019 extending till 2 months. An informed consent was obtained from the participating population and the ethical clearance was given by the Institutional Ethical committee of Babu Banarasi

Das College Of Dental Sciences. The sample size was estimated to be 288 based on previous literature. Pre validated questionnaire was taken. No change was adopted in the questionnaire.A two-stage random sampling technique was used. Lucknow city was divided into five zones (north zone, south zone, east zone, west zone, and central zone). The sample was obtained from the Uttar Pradesh state Dental Council. The age of dentist was 26-56 years and minimum practice was of 6 months. A 11 variable, structured, self-administered, close ended questionnaire in English was given to each dentist to evaluate their knowledge and practice regarding forensic odontology in Lucknow city. The variables assessed were, (questionnaire is added) 5 knowledge based, 3 attitude based and 3 based on practice. The question consisted of knowledge regarding significance of maintaining dental records in identifying the deceased and crime suspects, How to identify physical/neglective/sexual/psychological abuse of a child, estimation of the age of an individual by examining the teeth, the most accurate and sensitive method to identify an individual and How will they identify the age and gender of the deceased in the event of a mass disaster. It also checked for their attitude regarding pattern of bite mark , What would you do if you identify signs or symptoms of child abuse, if they were aware about testifying as an expert witness in the court to present forensic dental evidence And practice regarding any formal training in collecting, evaluating and presenting dental evidence maintenance of dental records in the clinic the method and duration of maintenance of dental record. The questionnaire was distributed personally by the investigator herself and collected back the same day. Thedata collected were entered in IBM SPSS statistics 20 and percentage was calculated for the followingrespective of their specialty were included in the study. Chi square was applied with p<0.05

RESULT

Out of 288 dentist the respondant rate was 100%. It was observed that 96.5% dentist maintain dental records.

Out of 96.5% of dentist 93.8% maintain personal details & 81.9% take medical history. 42.7% of them ask patient for patient history. 89.9% keep record of clinical finding & 70.1 % maintain record of treatment plan. 72.6 % maintain radiographs of patients. 36.5% of dental practitioners maintain record of investigation finding. Where as 27.1 % maintain treatment log of patient. Only 10.1% maintain photographs & study casts.

The average time span of maintaining dental records amongst dentist was 3 years.

99.7% of dental practitioners were aware of the significance of maintaining dental records in identifying the deceased and crime suspects.

Approx 80% of dentists were aware of child abuse. Out of which 78.5% identified child abuse through physical injury, 86.8% recognize through behavioral changes, 34.7% checked for scars, while 1% discover through clothing and only 4.5 % didn't know about child abuse.

60.8% of dentist adopted child counselling, 48.3% asked question to parents, while 25.7% refered children for medical examination. 0.3 % neglected and didn't know What to do if they identify signs or symptoms of child abuse.

30.6% examine the age of an individual through dental while 82.8 % identify through age whereas 4.5 % had no knowledge about estimation of age.

90.6 % believed finger prints to be the most sensitive method of identification, while 13.2% believed in DNA comparison, 4.2% considered Physical anthropological examination of bones and teeth, 4.5% believed in Serological comparison, only 0.3% believed in visual identification.

95.5% were aware of bite mark pattern of teeth while 4.5% weren't aware of bite mark pattern of teeth.

69.8% of dentist had formal training in collecting, evaluating and presenting dental evidence while 30.2% had no idea about it.

70.1% were aware that they can testify as an expert witness in the court to present forensic dental evidence whereas 29.9% were not aware of it.

In case of mass disaster to identify the age and gender of the deceased 55.6% believed in DNA examination of tooth, 26% considered jaw examination, 22.6% said they would check for erupted teeth 9.4% weren't aware of it.

Table 1 shows the result of significance on applying chi square test. It shows an association with MDS.

QUESTIONS	BDS	MDS
If yes, which of the following are regularly maintained, and for how long?	0.04	0.03
Are you aware of the significance of maintaining dental records in identifying the deceased and crime suspects?	0.81	0.001
How can you identify physical/neglective/sexual/psychological abuse of a child?	0.71	0.96
What would you do if you identify signs or symptoms of child abuse?	0.67	0.23
How do you estimate the age of an individual by examining the teeth?	0.07	0.02
Which of the following is the most accurate and sensitive method to identify an individual?	0.08	0.96
Are you aware of the bite mark patterns of teeth?	0.41	0.039
Have you had any formal training in collecting, evaluating and presenting dental evidence?	0.037	0.09
Are you aware that you can testify as an expert witness in the court to present forensic dental evidence?	0.065	0.21
How will you identify the age and gender of the deceased in the event of a mass disaster?	0.57	0.032

Chi square applied, $p < 0.05$

DISCUSSION

Teeth are the hardest and most robust tissues of the human body, and often resistant to decay even in difficult cases of accidents, crime, burial or other severe exposure to the elements. In addition, the dental

patterns are characteristic for individual identification and therefore available for useful comparison if records exist for the purpose.16

The focus of the present study is on the knowledge, awareness, and practice of forensic odontology among dentists in Lucknow. The knowledge and awareness level regarding forensic odontology among the subjects is adequate and there is significant variation in practice and management in different studies, which could be attributed to the difference in sample size and to the different study settings. A self-reported questionnaire was used for gathering information from the subjects regarding forensic odontology. This may have increased the risk of bias while evaluating studies on knowledge and awareness. Three studies used a close-ended questionnaire to gather information about various aspects of forensic odontology from their study subjects, while only one study used a questionnaire that contained both open- and close-ended questions.The advantage of using a close-ended questionnaire is that it reduces recall bias, and such questions are easy to analyze and may achieve quicker response from the subjects.

It can be seen from the results that almost all the subjects in one of the studies had knowledge regarding forensic odontology compared to other studies. This could be due to the reason that forensic dentistry constitutes a significant portion of the subject of Oral Pathology and Microbiology in the postgraduate syllabus. 7

The dental record is a legal document owned by the dentist and contains subjective and objective information about the patient. Results of the physical examination of the dentition and supporting oral and surrounding structures must be recorded. In addition, the results of clinical, laboratory tests, study casts, photographs and radiographs become components of the record and should be kept for 7-10 years and records of pediatric dental patients be retained until the patient reaches the age of maturity.4

Computer-generated dental records are becoming more common for record keeping. The advantage of maintaining an electronic record is that it can be easily networked and transferred for routine professional consultation or forensic cases requiring dental records for identification. Computer-assisted management technology has been an asset in expediting the comparison of antemortem and postmortem dental record information .17

The respond rate was seen to be 100% out oOut of which 93.8% maintain personal details which is more when compared to study done by Shivani Bhakhri et al18 in 2017 where 25.5% maintained personal details.

It was observed that 81.9% take medical history. 42.7% of them ask patient for patient history. 89.9% keep record of clinical finding & 70.1 % maintain record of treatment plan. 72.6 % maintain radiographs of patients. 36.5% of dental practitioners maintain record of investigation finding. Where as 27.1 % maintain treatment log of patient. Only 10.1% maintain photographs & study casts which was in accordance to study done by Khalaf Al et al in Saudi Arabia in 2017.19

The average time span of maintaining dental records amongst dentist was 3 years.

99.7% of dental practitioners were aware of the significance of maintaining dental records in identifying the deceased and crime suspects.

Estimation of age by assessing the stages of tooth development has often been the preferred method as it closely coincides with the chronological age and it can be evaluated using radiographs.Age estimation by analysing the dental development was done using radiographs. Demirjian's method is one of the oldest

and most widely used radiographic method for ascertaining dental age due to its simplicity, preset criteria for evaluating tooth maturity, schematic illustrations and gender specific maturity scores.20 4.5 % did not know how to estimate the age of an individual which is better when compared with other studies done by et al in Chennai6 where 41% did not know how to estimate the age of an individual.

Human beings have wittingly or unwittingly discovered the teeth as a veritable weapon for attack or defence in times of various emotions. A study shows a 13.2% incidence of usage of the teeth as assault weapon. Similar high incidences of human bite has also been reported from Tanzania, the US and UK and Papua New Guinea.21 The anatomical location, severity, and quality of the bite marks have significance in the identification of the individual. The information such as demographics (name, age, sex, date, etc.), location, size, shape, color, type of injury, and swabs should be collected from the bite victim.10

95.5% were aware of bite mark pattern of teeth while 4.5% weren't aware of bite mark pattern of teeth. Where as in Saudi 64.5 % were not aware of bie mark pattern of teeth.19 In the present study 69.8% of dentist had formal training in collecting, evaluating and presenting dental evidence while 30.2% were unaware While in a similar study done in Mysore by Sushma Radaswammy22 76.5 % hadn't not undergone training.While in Saudi19 only 30.3% have under wenttrainig of collecting dental evidence.

It was observed that 70.1% were aware that they can testify as an expert witness in the court to present forensic dental evidence whereas 29.9% were not aware of it.

While The term mass disaster means a chaotic event, initiated by a destructive force, which results in the multiple fatalities necessitating identification. The identification of large number of casualties in mass disaster is complex due to severe mutilation, charring and decomposition. The routine identification data fall short in such cases. Teeth are the hardest and chemically most stable tissues in the body. Moreover, teeth and jaws are usually well-protected from fire and mechanical trauma and are highly resistant to postmortem destruction and decomposition. Hence, dental identification is one of the most reliable methods of comparative identification in cases of mass disasters. Human dentition is considered hard tissue analog to fingerprints (reliable tools only in a body obtained before decomposition or mutilation).7

In a study done by John OladapoObafunwa et al on DANA air crash.Forensic odontology was the primary identifier in 10% of the cases.23

In a mass disaster involving a train accident in Zagreb, Croatia, only 5% of the victims were identified whereas 33% and 100% of British and Slovenian nationals were identified respectively in a plane collision by dental means alone.

Similarly, in the Thai Tsunami of 2004, 61% of the victims were identified solely by dental methods, 1.3% by DNA,19% by fingerprinting information and 18% by the combination of more than one type . This was also the pattern seen when the Danish team went into Thailand after the Tsunami to help with identification. The team worked from December 2004 to June 2005 and was able to identify 70.3% of Denmark nationals with the use of forensic odontology alone, and another 5.4% in combination with fingerprinting information. Fingerprinting was used in only 21.6% and DNA was used inonly one identification in combination with fingerprinting. Only one Danish individual was not identified in that study.23

In the present study when asked about identification in case of mass disaster to identify the age and gender of the deceased 55.6% believed in DNA examination of tooth, 26% considered jaw examination,

22.6% said they would check for erupted teeth 9.4% weren't aware of it.in a study in Chennai 42 % don't know how to identify the deceased Whereas in study by Shivani bhakhi 59.4% were unaware of it.

LIMITATION

The limitation of the study are response bias and social desirability bias as all the participants of the study are dental practitioners and the evaluating body also consists of dental practitioners. Since the study sample was not too large hence the study cannot be generalized.

RECOMMENDATION

CDE programs should be conducted to increase the knowledge regarding forensic odontology

Patient history and records should be maintained regularly not only for legal Purpose but it can also be helpful in times of emergency.

Forensic odontology as a part of curriculum should be taught during BDS

Forensic odontology courses should be introduced as a separate course by the concerned dental council like other dental specialities to enable practitioners to specialize in the subject.

CONCLUSION

The study was a cross sectional study on dental practitoners of Lucknow city.

To maximize dental application in forensic cases, it is necessary that dental practitioners should know the basic principles and techniques of the subject.

Moreover, all the studies on knowledge and awareness levels regarding forensic odontology were conducted in urban areas. Therefore, its recommended that similar studies involving dentists in rural settings and in other states of the country should be conducted so that more valuable data can be accumulated.

REFERENCE

1.   https://aboutforensics.co.uk/forensic-odontology/

2.   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.

3.   T Smitha, H S Sheethal, K N Hema, and R Franklin J Forensic odontology as a humanitarian toolOralMaxillofacPathol. 2019 Jan-Apr; 23(1): 164.

4.   Shalini Gupta, Archana Agnihotri,Akhilesh Chandra, and Om Prakash Gupta. Contemporary practice in forensic odontologyJ Oral MaxillofacPathol. 2014 May-Aug; 18(2): 244–250.

5.   Gambhir RS, Singh G, Talwar PS, Gambhir J, Munjal V. Knowledge and awareness of forensic odontology among dentists in India: a systematic review. J Forensic Dent Sci 2016;8:2-6.

6.   Navya N, Raj JD. To assess the knowledge and attitude toward forensic odontology among dentists in Chennai city. Int J Forensic Odontol2016;1:17-20.

7.   Harchandani N, Marathe S, Hebbale M, Ul Nisa S, Hiremutt D. Awareness of forensic odontology among general dental practitioners in Pune -- a cross-sectional study. J Adv Med Dent Scie Res 2014;2:10-6.

8.   Khare P, Chandra S, Raj V, Verma P, Subha G, Khare A. Status offorensic odontology in metro and in tier 2 city in urban India. J Forensic Dent Sci 2013;5:134-7.

9.   Nagarajappa R, Mehta M, Shukla N, Tuteja JS, Bhalla A. Awareness of Forensic Odontology among Dental Practitioners in Kanpur City, India: a kap study. J Dent Res Updates 2014;1:6-12.

10.   Sharma A, Shokeen S, Arora R, Dhaginakatti SA. Survey on knowledge, attitude and practice forensic odontology among private dental practitioners in Ghaziabad city, India. J Dent Specialities2015;3:43-7.

11.   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. J Forensic Dent Sci 2014;6:58-61.

12.   Singh NN, Gowhar O, Ain TS, Sultan S. Exploring trends in forensic odontology. J Clin Diagn Res 2014;8:ZC28-30.

13.   Sahni A, Rehani S, Mathias Y, Kardam P, Nagpal R, Kumari R. A questionnaire survey on forensic odontology: are we really aware? J Forensic Dent Sci 2016;8:113

14.   Sharma A, Shokeen S, Arora R, Dhaginakatti SA. Survey on knowledge, attitude and practice forensic odontology among private dental practitioners in Ghaziabad city, India. J Dent Specialities2015;3:43-7.

15.   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. J Forensic Dent Sci 2014;6:58-61.

16.   Elza Ibrahim Auerkari. Recent trends in dental forensics. Indonesian Journal of Legal and Forensic Sciences 2008; 1(1): 5-12.

17.   Neville BW, Damm DD, Allen CM, Bouquot JE. 3rd edition. New Delhi: Elsevier; 2009. Oral and Maxillofacial Pathology; pp. 113–9. [Google Scholar]

18.   Bhakhri et al., Perception of Forensic Odontology and its Practice among the Local Dentists of an Institution. Journal of Forensic Res 2017, 8:3.

19.   Al-Khalaf. A H, Al Nahawi D E , Al Naser H H And Nazir M. The Knowledge And Practice Of Forensic Dentistry Among Dental Practitioners In The Eastern Province, Saudi Arabia. International Journal of Advanced Research.2017;5(8):1971-1978.

20.   SivasankariPeriyakaruppan, Manasa Anand Meundi1 & Chaya Manoranjini David. Accuracy of age estimation in 6-21 year old South Indian population – A comparative analysis of clinical and radiographic methods. J Forensic Odontostomatology. 2018. Dec;2(36):10-19.

21.   RobsamSO, Ihechi EU, Olufemi WO. Human bite as a weapon of assault. Afri Health Sci 2018;18(1): 79-89.

22.   Rudraswamy S, Doggalli N, Chandrashekar BR, Manjunath M, Sreeshyla HS. Forensic odontology acquaintance among the students of a dental institution in Mysore City, India. Int J Forensic Odontology 2017;2:13-7.

23.   John Oladapo Obafunwa1, Victor Olabode Ogunbanjo, Ogunbiyi Babatunde Ogunbanjo, Sunday Sokunle Soyemi1,&, Francis AdedayoFaduyile. Forensic odontological observations in the victims of DANA air crash. Pan African Medical Journal. 2015; 20:96.