

A Study on Forensic Odontology as Future Perspective among Private Dental Practitioners of Ahmedabad, Gujarat: A Cross-Sectional Study

Sona A Sheth¹, Ashish S Sharma^{2*}, Devarshi J Pandya³, Hamza S Kachwala³, Manali D Vora³ and Riya G Talavia³

¹Head of Department/Reader, Department of Public Health Dentistry, AMC Dental College and hospital, Opposite Anupam Talkies, Khokhara, Ahmedabad, Gujarat, India.

²Lecturer, Department of Public Health Dentistry, AMC Dental College and hospital, Opposite Anupam Talkies, Ahmedabad, Gujarat, India.

³Intern, AMC Dental College and hospital, Opposite Anupam Talkies, Khokhara, Ahmedabad, Gujarat, India.

*Correspondence:

Ashish S Sharma, Lecturer, Department of Public Health Dentistry, AMC Dental College and hospital, Opposite Anupam Talkies, Ahmedabad, Gujarat, India, E-mail: drash29@gmail.com.

Received: 25 August 2018; Accepted: 19 September 2018

Citation: Sona A Sheth, Ashish S Sharma, Devarshi J Pandya, et al. A Study on Forensic Odontology as Future Perspective among Private Dental Practitioners of Ahmedabad, Gujarat: A Cross-Sectional Study. Oral Health Dental Sci. 2018; 2(3); 1-5.

ABSTRACT

Background: Forensic Odontology is based on fact that, the natural teeth can withstand degradation from extreme conditions even after the death of an individual. Hence, teeth are considered to be very crucial for identification during the investigative procedures, especially when there is lack of any other evidence.

Aims: To analyze the level of awareness, feasibility and future perspective of Forensic Odontology among private dental practitioners of Ahmedabad City, Gujarat.

Materials and Methods: It is a cross-sectional study, in which 210 private dental practitioners participated voluntarily from each of the six zones of Ahmedabad. The sample size was assessed using simple random sampling and then it was divided in six zones by stratified random sampling. A self administered structured questionnaire with a multiple-choice question was designed. Chi-square test was done using SPSS version 20 software.

Results: In this study, we found that >50% of dentists are aware of regarding the basic principles of Forensic Odontology and >70% of dentists maintain Patient's details as dental records followed by radiographs. A significant finding was that around 58.7% and 72.7% of dentists were aware regarding testifying as an expert witness in court to present dental evidence and the awareness of any formal training courses of Forensic Odontology in the country respectively.

Conclusions: The dentists were aware regarding basic principles of Forensic Odontology but they reveal poor attitude and practice regarding implementing it in everyday life. Hence there is dire need of organizing training programmes/conferences/workshops on forensic odontology.

Keywords

Forensic Odontology, Cross sectional survey, Dental records, Chi square test, knowledge, Attitude, Practices, Sampling, Workshops, Evidence.

Key Messages

Forensic Odontology: A Dentist's weapon in assisting legal and criminal issues thus solving various cases having no evidence except teeth and identification of human beings who are unidentified, either dead or alive thus leading to healthy society.

Introduction

Forensic Odontology is that branch of forensic medicine which in the interest of justice deals with the proper handling and examination of dental evidence and with proper evaluation and presentation of the dental findings [1]. In India, first case of identification using dentition was that of king Canouj, Jayachandra Rathore in 1191, who died in war and his body was recognized by his false anterior teeth [2].

Not only does Forensic Odontology help in manmade disasters,

but also after natural calamities like Tsunami, earthquake, or in identification of decomposed and charred bodies as in drowning, burns and victims of motor vehicle accidents [3].

There are several areas of specialty with forensic dentistry, which include the assessment of cases of abuse (child, domestic partner or family), identification of found human remains and identification in mass fatalities, bite mark analysis, lip print (cheiloscopy) analysis, Rugoscopy and DNA analysis [4].

Forensic Odontology helps in determination of age of persons, whose age is under question. From birth to 14 years of age, the degree of formation of root and crown structures, the stage of eruption and intermixture of temporary and permanent teeth are useful in age estimation [5]. Gustafson's method is used for the age estimation of adults over 21 years depends on the physiologic age changes in each of the dental tissues [6].

Teeth pulp can help in finding out sex with the help of Barr bodies and Y chromosome and DNA analysis [7]. The professional obligation of Dental Surgeon to mankind is not only to serve in examination, investigation, diagnosis, and treatment of oral and oro-facial lesions of local origin and oral manifestations of systemic diseases, but also to serve in other community services and legal matters [8].

Aims

To analyze the level of awareness, knowledge and feasibility of Forensic Odontology among private dental practitioners of Ahmedabad City, Gujarat.

Objectives

- To test the knowledge and awareness regarding forensic odontology among private dental practitioners of Ahmedabad City, Gujarat.
- To analyze the scope of Forensic Odontology in private dental set up, whether the dental practitioners are ready to diagnose and treat medico legal cases and whether they meet the prerequisites or not.
- To assess the dentist's readiness to help the forensic odontology experts in solving medico-legal cases.
- To determine the future perspective of Forensic Odontology in dentistry.

The hypothesis of the study was that the knowledge and awareness of Forensic Odontology among private dental practitioners had any impact on implementation and future perspective of this branch for the welfare of the community.

Materials and Methods

Study design and Sampling

It is a cross-sectional study/survey, in which 210 private dental practitioners including B.D.S. and M.D.S. participated voluntarily from each of the six zones of Ahmedabad City.

For the feasibility and better coverage and results of the study,

the six zones were included in study, according to the information obtained from the Ahmedabad Municipal Corporation website http://ahmedabadcity.gov.in/portal/jsp/Static_pages/amc_zone_list.jsp

- Zone 1: North
- Zone 2: South
- Zone 3: East
- Zone 4: Central
- Zone 5: West
- Zone 6: New West

The total number of sample size was 210 that were calculated through simple random sampling. For the homogeneity of the sample; the total sample size was divided into six zones using stratified random sampling, thus each zone having 35 study participants.

Sample size formula – Simple Random Sampling $n = \frac{4pq}{L^2}$
Where p = Proportion of knowledge of Forensic Odontology = 15.5% (p is obtained from pilot study) and $L = 5\%$
Hence, sample size $n = 210$

Ethical Consent

The ethical approval for the study was obtained from the institutional ethical review board of AMC Dental College and Hospital. The ethical approval letter number is AMC/ IRB/20217. The written permission from the Dean of AMC Dental College and Head of Department of Public Health Dentistry was taken prior to the survey.

Time Scale and Place of Study

The proposed study was conducted from 1st August 2017 to 31st August, 2017. Days per week were selected based on feasibility and availability of the participant. The proposed cross sectional survey was conducted amongst 210 private dental clinics in each of the six zones of Ahmedabad City, Gujarat.

Selection Criteria

Inclusion criteria

- Private dental practitioners having their own private setup selected from the 6 zones of Ahmedabad city.
- Registered dentists under Gujarat State Dental Council.
- Dentists willing to give consent were included in the study.

Exclusion Criteria

- Dentists not working in private clinics of Ahmedabad City.
- Dentists that aren't registered under Gujarat State Dental Council.
- Dentists who don't have their own private clinic.
- Dentists who are not willing to give consent.
- PG students working in private clinics.

Materials/ Equipment for the Study

An informed consent form. A participant information sheet along with self-administered, structured questionnaire comprising of 15

close ended multiple choices questions designed for this survey. No equipments were used for this study.

Method for Collection of Data

A self-administered structured questionnaire of 15 questions in English was designed for this survey after pilot study. Questionnaire includes response elicited through multiple choices and yes/no questions. A 15 item structured questionnaire was then used to assess the knowledge of the dentists regarding forensic odontology. Questions regarding their attitude and practice about maintenance of dental records were also assessed.

The proposed study was conducted in private dental clinics of 6 zones of Ahmedabad, Gujarat. The participants of the study were visited personally by the principal investigator. Prior to the start of the study, the participants were informed about the purpose of the study and the duly signed informed consent was taken from each participant. A self administered structured questionnaire was given to the participants that will take around 5 to 7 minutes to fill it approximately. Each participant who signed the informed consent form and returned completely filled questionnaire were only considered for the study.

The collected data was then entered at the end of the study in the master chart prepared in Microsoft Excel 2010 on the computer. Chi square test was used for statistical analysis by using SPSS version 20 (IBM, Armonk, New York, USA) software.

Results

The total numbers of participants were 150 constituting 55% BDS and 45% MDS degree wise, out of the total, 62% were male and 38% were female as shown in Table 1. The total female-to-male ratio was 1:2.

Gender and Education details of study participants N (Total) = 150		
Level of Education Number of Respondents (%)	MDS	68 (45)
	BDS	82 (55)
Gender	Male	93(62)
	Female	57(38)

Table 1: The total female-to-male ratio was 1:2.

The questions asked to the participants were about their knowledge and awareness about Forensic Odontology. The first question asked was regarding whether they were aware that teeth can serve as a sole evidence in sex determination or not, to which 64.7% of MDS participants replied correctly, 41.5% of BDS replied correctly, indicating that a total of 52% of population were aware, as shown in Table 2.

The next question asked was about which method is reliable to identify the age of an individual, to which a total of 69.3% of the population answered correctly, i.e. all of the above. 76.5% of MDS and 63.4% of BDS were aware that enamel translucency, reduction in pulp chamber morphology and cementum annulations are

reliable parameters to identify the age of an individual as shown in Table 2.

Next in line, knowledge regarding when teeth is the sole evidence at the crime scene, what could be used for sex determination was tested. The result came out to be significant, 52 percent of the total participants answered positively, that Barr bodies can be used for sex determination. Only 64.7% of MDS and 41.5% of BDS participants gave positive answer as shown in Table 2. The question regarding palatal rugae being a unique feature to every individual, to which 64.7% of the total population answered positively that Palatal rugae are indeed unique to every individual. Out of which 76.5% of MDS and 62.2% of BDS participants answered positively as shown in Table 2.

The question asked, regarding which is the next ideal method that can be used in identification of an individual when finger printing is not possible in case of charring or amputation of fingers, out of total participants only 35.3% individuals gave positive answer that palatal rugoscopy is the next ideal method to fingerprinting. Only 33.8% of MDS and 36.6% BDS were aware about it as shown in Table 2. To the question regarding action as a dentist after identifying signs and symptoms of child abuse, 50% of the total participants gave positive response that it needs to be reported to police first. Out of that, 57.4% of MDS and 43.9% of BDS gave positive response. About the question, regarding awareness for testifying as an expert witness in court to present dental evidence, for that 58.7% of total participants answered positively- out of which 67.6% were MDS and 51.2% were BDS as shown in Table 2. For the question, regarding the knowledge for correct sequence of recording bite marks, to which 64.4% of total population gave positive answer. The correct sequence is Photograph, impression and models, collection of swabs, Ultraviolet illumination. Out of total, 63.2% of MDS and 64.6% of BDS gave positive answer.

For the question regarding attitude of dentists whether they can help forensic experts by maintaining records or not; to which 98.7% of the total participants answered positively .Out of that almost 100% of MDS and 97.6% of BDS answered positively. That means, 1.5% of MDS and 6% of BDS admitted of not maintaining dental records at all as shown in Table 3. To the response regarding the type of dental records being maintained, for which maximum number of participants (both MDS and BDS) chose patient's details, next on the list was radiographs, as shown in Table 4. For the question focused on the time duration for which the dental records should be maintained in medico legal cases, 59.3% of total participants gave positive response that it should be maintained for at least 3 years in medico legal cases. Out of that, 67.6% of MDS and 52.4% of BDS gave accurate response.

One of the highlight findings in our study was regarding the awareness of any formal training courses of Forensic Odontology in the country, 72.7% of respondents admitted positive awareness for it, out of which 86.8% of the MDS and 61% of the BDS gave positive response as shown in Table 2. The next question about their willingness to undergo any such formal training, for

which 44% of total participants said they would definitely like to undergo training in Forensic Odontology, out of which 45.6% of the MDS and 42.7% of the BDS gave positive response regarding training in Forensic Odontology, as shown in Table 3. The result also revealed that there were 2 trained individuals in Forensic Odontology among the study participants, as shown in Table 3. The last question regarding the knowledge of any criminal case solved with the help of Forensic Odontology, to which 53.3% of total participants answered positively. Out of which 61.8% of MDS and 46.3% of BDS participants gave positive response as shown in Table 2.

Questions	MDS (n=68)	BDS (n=82)	Total (n=150)	P(Chi square)
Teeth can serve as a source of DNA or not	59 (86.8)	67 (81.7)	126 (84.0)	0.400
Reliable method to identify the age of an individual	52 (76.5)	52 (63.4)	104 (69.3)	0.840
Tooth being sole evidence at the crime scene, the thing that is used for sex determination	44 (64.7)	34 (41.5)	78 (52.0)	0.005*
Knowledge regarding palatal rugae being unique to every individual	52 (76.5)	51 (62.2)	103 (68.7)	0.061
Knowledge regarding next ideal method that can be used for identification of an individual when finger printing is not possible	23 (33.8)	30 (36.6)	53 (35.3)	0.725
Attitude regarding action by dentists after identifying sign and symptoms of child abuse	39 (57.4)	36 (43.9)	75 (50.0)	0.101
Awareness regarding able to testify as an expert witness in court	46 (67.6)	42 (51.2)	88 (58.7)	0.042*
Knowledge regarding correct sequence in recording bite marks	43 (63.2)	53 (64.6)	96 (64.0)	0.859
Consent regarding helping forensic experts by maintaining records	68 (100)	80 (97.6)	148 (98.7)	0.193
Knowledge regarding duration of dental records to be maintained minimally in medico-legal cases	46 (67.6)	43 (52.4)	89 (59.3)	0.059
Awareness regarding any formal training courses for forensic odontology in India	59 (86.8)	50 (61.0)	109 (72.7)	0.000**
Information regarding any criminal case solved with the help of forensic odontology	42 (61.8)	38 (46.3)	80 (53.3)	0.059

Table 2: Statistical interpretation of Knowledge and Awareness amongst Study Participants n (%).

Question	Response	MDS (n=68) (%)	BDS (n=82) (%)	Total (n=150) (%)
Response regarding maintenance of dental records	Yes	67 (98.5)	77 (94.0)	144 (96.0)
	No	01 (1.5)	05 (06.0)	06 (4.0)
Response regarding training in Forensic Odontology	Yes	31 (45.6)	35 (42.7)	66 (44.0)
	No	36 (53.0)	45 (54.9)	81 (54.0)
	Trained	01 (1.4)	02 (2.4)	03 (2.0)

Table 3: Practice and Attitude regarding Forensic Odontology among dental surgeons, n (%).

Types of Dental Records	MDS (n=82)		BDS (n=68)	
	No.	%	No.	%
Study Casts	14	17.07	12	17.65
Family history	10	12.2	12	17.65
Treatment plan	16	19.51	23	33.82
Photographs	24	29.27	28	41.18
Treatment log	15	18.29	21	30.88
Radiographs	50	60.98	48	70.59
Patient's Details	74	90.24	59	86.76

Table 4: Response regarding the major type of dental records being maintained n (%).

Discussion

In the present study, we found that the participants had adequate knowledge about the basic principles of Forensic Odontology, which they might have acquired during their study period, continuing dental education or while teaching. These findings are in contrast with the study conducted by Preethi et al. in 2011 [9] and Navya and Raj in 2016 [10], showing that general dental practitioners have inadequate knowledge and interest in forensic odontology.

Ours study revealed poor attitude and practice regarding implementation of forensic odontology in everyday life. This might be due to restrained man power and lack of organization to preserve the dental records. The findings are in correlation with the study conducted by Preethi et al. in 2011[9] and Navya and Raj in 2016 [10]. Due to time constraint, sample size was kept minimum, but we wish to continue the survey with a larger sample size, which would accurately represent the total population.

On the basis of the results of this study, modifications can be done in dental curriculum at student level only to have in depth knowledge regarding concepts and practical implementation of Forensic Odontology, which can be prolific in dissemination and creating solid pillars of this neglected subject of dentistry thus solving and concluding unsolved medico legal cases and paving the way for healthy society.

In developing countries like India, utilization of forensic odontology in the criminal justice system is minimal. It is yet to gain full momentum. The death toll in India due to the tsunami in 2004 was more than 15,000, but it is a question left unanswered, whether all victims were identified. This could have been made possible if there wasn't a dearth of forensic odontologists in the country that would have aided in identification of the victims. Thus, it is very important that more people must be properly educated and trained to handle cases related to forensic odontology [11].

This is an exploratory study conducted on a small scale, so it needs to be further expanded to get better understanding of the results. This is a small pilot study and it needs to be done on larger scale involving private dental practitioners of Gujarat state also to have better insight regarding the importance of Forensic Odontology.

The time constraints and sample size might have affected the outcome of study to a lesser extent. The participants availability at the clinic at the time of survey has affected the feasibility of the survey. Source bias can be found here from the participants as some of them might have unknowingly answered just by guessing, which might be able to affect the results of the study.

Conclusion

Recent tragedies and past and present situations have increased awareness concerning the importance of forensic dentistry in identification of victims and perpetrators. To maximize dental application in forensic cases, it is necessary to train dentists in the practical aspects of forensic odontology and there is necessity in exposing dentists to the basic principles and techniques of the subject. A combination of reliable conventional methods and potentialities of advanced sciences can make wonders in the Science of Forensic Dentistry.

With this study we will be able to evaluate the future scope of Forensic Odontology in private dental clinics. This study will enhance the need of organizing training programmes/conferences/workshops on forensic odontology. Also we may be able to motivate the dentists to actively participate in medico legal cases which can be solved by knowing the basic principles of forensic odontology.

Acknowledgments

We would like to sincerely thank Dr. Dolly Patel, Dean, AMC Dental Hospital and College, for permitting us to conduct this survey.

References

1. Kewal Krishan, Tanuj Kanchan, Arun K Garg. Dental evidence in forensic identification an overview, Methodology & Present study. Open dent J. 2015; 9: 250-256.
2. Sansare K. Forensic odontology, historical perspective. Indian J Dent Res. 1995; 6: 55-57.
3. Wadhwan V, Shetty DC, Jain A, et al. A call for a new speciality: forensic odontology as a subject. Journal of Forensic Dental Sciences. 2014; 6: 97-100.
4. Bekir Karaarslan, Emine Sirin Karaarslan, Ertan Ertas. Age Estimation for dental patient using orthopantomographs. Eur J Dent. 2010; 4: 389-394.
5. Reddy K S Narayan, Murty OP. The essentials of forensic medicine and toxicology (34th ed.). Jaypee Brothers Medical Publishers (P) Ltd. 2017; 67-69.
6. Anoop K.Verma, Sachil Kumar, Abhishek Pandey. Role of dental expert in forensic odontology. Natl J Maxillofac Surg. 2014; 5: 2-5.
7. Vanita Rathod, Veena Desai, Rashmi Chandraker. Role of forensic dentistry for dental practitioners: a comprehensive study. J forensia Dent Sci. 2017; 9: 108-109.
8. Sharma P, Saxena S, Rathod V. Cheiloscopy. The study of lip prints in sex determination. J Forensic Dent Sci. 2009; 1: 24-27.
9. S Preethi, A einstein, B Sivapathasundharam. Awareness of forensic odontology among dental practitioners in chennai: a knowledge, attitude and practice study. J Forensic Dent Sci. 2011; 3: 63-66.
10. Navya N, Raj JD. To assess the knowledge and attitude toward forensic odontology among dentists in chennai city. Int J Forensic Odontol. 2016; 1: 17-20.
11. Tsunami Toll Updated. SBS World News. 2005.