Original research

AWARENESS OF FORENSIC ODONTOLOGY AMONG DENTAL PRACTITIONERS IN KANPUR CITY, INDIA: A KAP STUDY

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ABSTRACT

Background: Forensic dentistry is a challenging and fascinating branch of forensic science that involves the application of dental sciences in the identification of deceased individuals through the comparison of ante- and post-mortem records. **Objective:** To assess the knowledge, attitude and practice of forensic odontology among dental practitioners in Kanpur city. **Materials and Methods:** A cross-sectional study was conducted among 149 dental practitioners in Kanpur who in their day-to-day life might be encountering cases of forensic interest. Data was collected in a personalized manner by means of a pre tested close ended questionnaire which contained 17 items. The reliability of the questionnaire presented a Cronbach's alpha of 0.728. Chi square test was used for statistical analysis. **Results:** All the dental practitioners maintained dental records in their clinic/workplace and only 12.2% were maintaining dental records for more than three years. The significance of ante-mortem records in identifying deceased suspects was known to 93.9% of the dental practitioners. Formal training in collecting, evaluating and presenting dental evidence was known among 87.8% of the study population. The comparison of responses in relation to gender, qualification and years of experience was statistically not significant ($p>0.05$). **Conclusion:** The findings of the present study revealed adequate knowledge and good attitude. Lack of practice in maintaining dental records for longer time was observed among majority of the study participants.

Keywords: dental practitioners, forensic odontology, knowledge, attitude and practice study.

INTRODUCTION

Forensic dentistry is a challenging and fascinating branch of forensic science that involves the application of dental sciences in the identification of deceased individuals through the comparison of ante- and post-mortem records. From AD 66 till date, dental identification has proved vital in identifying deceased individuals, the first case being accepted by the law in the year 1849.[1] Recently, forensic odontology has evolved as a new ray of hope in assisting forensic medicine, but, this vital and integral field of forensic medicine is still in a state of infancy in India.[2]

Forensic science refers to areas of endeavor that can be used in a judicial setting and accepted by the court and the general scientific community to separate truth from untruth.[1] Forensic is derived from the Latin word forum, which means "court of law". Odontology refers to study of teeth. Forensic odontology, therefore, has been defined by the Federation Dentaire International (FDI) as that branch of dentistry which, in the interest of justice, deals with the proper handling and examination of dental evidence, and with the proper evaluation and preservation of dental findings.[3]The various materials used in identification of human remains are the personal belongings like pieces of clothing, jewelry, fingerprints from blood grouping and dentition. Human dentition is considered as hard tissue analog to the fingerprints. It is almost as unique to an individual as fingerprints. Each adult human dentition consists of thirty two teeth of which some may be missing or malformed. Effects of various environmental events, like nutrition, drugs etc will also be manifested on the teeth.

Each race has characteristic appearances on the dentition. With such an extensive array of differences, it is extremely rare to have two similar dentitions. Teeth are one of the most durable parts of our body which can withstand more assaults than any other part of the body. This is particularly useful in the identification of bodies in mass disasters and natural calamities.[2] Historically age assessment using

teeth was first published by Edwin Saunders in 1857 who claimed that teeth provided the most reliable guide to age compared to age estimation from height which was a standard method used during that time.[2]Age is one of the essential factors in establishing the identity of the person and a critical component in dental profiling. Small variations in the tooth formation and eruption among persons have made dental estimation of chronological age the primary method of age determination for younger persons. The use of radiographs is characteristic of techniques that involve observation of the morphologically distinct stages of mineralization.[3]

The important applications of forensic odontology include identification of human remains through dental records and assisting at the scene of crime; in cases of suspected child or adult abuse through bite marks or physical injuries; determination of age and gender of the living or deceased and to testify as an expert witness in the court to present forensic dental evidence.[4] 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.[5] 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.[6] Hence the present study was conducted to assess the knowledge, attitude and practice of forensic odontology among dental practitioners in Kanpur city.

MATERIALS AND METHODS

Study design and population: A cross sectional descriptive study was conducted in October 2013 to determine the knowledge, attitude and practice regarding forensic odontology among dental practitioners in Kanpur city, India. The list of dentists was obtained from the office of the Indian Dental Association, Kanpur branch. A total of 192 (102 males, 90 females) dentists were available and the questionnaire was distributed to all. Among them 149 (77.6%) dentists responded with the complete questionnaire.

Ethical clearance: The study protocol was reviewed and approved by the Institutional Review Board of Rama Dental College Hospital and Research Center, Kanpur. Those willing to participate in the survey were requested to fill in the consent form and complete the questionnaire.

Pre-testing of the questionnaire: Questionnaire were administered to a panel of three academicians and a convenience sample of 15 dentists twice on successive days who were interviewed to gain feedback on the overall acceptability of the questionnaire in terms of length, language clarity, time, and feasibility of dentists completing and returning it. Based on the opinions expressed a mean Content Validity Ratio (CVR) of 0.87 among academicians and Cronbach's coefficient of 0.73 in dentists was found. Face validity was also assessed and it was observed that 92% of the participants found the questionnaire to be easy.

Methodology: A self administered, structured questionnaire written in English and validated through a pilot survey included 17 close ended questions on the knowledge, attitude and practices about the significance of dental records, identification of child abuse, dental age estimation, identification of an individual, bite marks and as a witness in the court and lip prints along with the demographic data. Dentists were visited by a single investigator, and all available and willing participants were given the questionnaire on the day of visit. Participants were asked to respond to each item in the questionnaire by choosing the most appropriate alternative. Confidentiality and anonymity of the respondents were assured.

Statistical analysis: The data was analyzed using the Statistical Package for Social Sciences version 15.0 software (SPSS Inc, Chicago, IL, USA). Descriptive statistics was used to summarize the sample and responses of the questionnaire. Chi square test was used

for statistical analysis. Level of significance was set at $p \leq 0.05$.

RESULTS

Majority of the study population were aged less than 45 years (81%) [mean age 34.2±2.94], males (55.1%), had a qualification of BDS (55.1%) and were practicing for less than 5 years (65.3%) [Table 1].

Table 1. Demographic profile of the study population.

Variables	Frequency N =149	%
Age in years		
25-35	80	53.5
36-45	41	27.5
46-55	22	15
56-65	06	04
Gender		
Males	82	55.1
Females	67	44.9
Qualification		
BDS	82	55.1
MDS	67	44.9
Experience in years		
< 5	98	65.3
5-10	39	26.5
> 10	12	8.2

Identification of child abuse was primarily made by observing the physical injuries and behavioral changes (81.6%). Child counseling (75%) followed up with questioning the parents (68.8%) and medical examination (58.3%) were the actions taken for child abuse fatality. Age estimation of an individual was done by chronological age (68.8%) and dental age (62.5%). The most sensitive methods to identify an individual were visual examination (75.5%), serological and DNA comparison (69.4%) and finger prints (63.3%). The age and gender of the deceased was chiefly performed by jaw examination (83.7%). Everybody had knowledge regarding bite marks pattern. Importance of dental records for identifying the diseased and crime suspects is high (93.9%). Further 6.1% were unaware of its significance. Significance of lip prints in presenting as dental evidence was observed in 71.4% of the study population [Table 2].

Table 2: Distribution of responses for knowledge based questions.

Variables	N (%)
Identify physical/neglective/sexual/psychological abuse of a child by	
Physical Injuries	122 (81.6)
Behavioral changes	122 (81.6)
Any Scars	91 (61.2)
Clothing	27 (18.4)
Don't Know	15 (10.2)
Action taken on positive signs or symptoms of child abuse	
Child Counseling	112 (75.0)
Ask question to parents	103 (68.8)
Medical Examination of Child	87 (58.3)
Neglect	3 (2.1)
Don't Know	22 (14.6)
Estimate the dental age of an individual by examining the teeth by	
Dental Age	93 (62.5)
Chronological Age	103 (68.8)
Don't know	50 (33.3)
Most accurate and sensitive method to identify an individual	
Visual identification	112 (75.5)
Finger prints	94 (63.3)
Physical anthropological examination of bones and teeth	33 (22.4)
Serological comparison	103 (69.4)
DNA Comparison	103 (69.4)
Don't know	9 (6.1)
Awareness on the bite mark pattern of teeth	
Yes	149 (100)
No	0 (0)
Identify the age and gender of the deceased by	
Jaw Examination	125 (83.7)
Erupted Teeth Examination	88 (59.2)
DNA Examination of the tooth	79 (53.1)
Don't know	12 (8.2)
Awareness on the lip prints for presenting dental evidence	
Yes	106 (71.4)
No	33 (22.4)
Don’t know	10 (6.2)
Dental records are useful in identifying the deceased and crime suspects	
Yes	140 (93.9)
No	9 (6.1)

All the dental practitioners maintained dental records and a higher proportion (82%) had started maintaining for less than 3 years only.

Regular maintenance of dental records included patient details (89.8%) followed with medical history (61.2%). Only half (51%) the participants' maintained records of patients' treatment plan and less than 35% retained the investigative records.vFormal training in dental evidence was appreciated among 87.8% [Table 3]. No statistical significance ($p>0.05$) was observed between the various variables according to gender, qualification and years of experience [Table 4].

Table 3: Distribution of responses to practice and attitude based questions.

Variables	N=149(%)
Do you maintain dental records	
Yes	149 (100.0)
No	0 (100.0)
Dental records regularly maintained	
Patient details	134 (89.9)
Medical history	91 (61.1)
Family history	43 (28.8)
Clinical finding	67 (44.9)
Treatment plan	76 (51.0)
Photographs	55 (36.7)
Study casts	52 (34.7)
Radiographs	33 (22.4)
Investigation finding	30 (20.4)
Treatment log book	76 (51.0)
Duration of maintaining dental records	
< 3	131 (87.8)
> 3	18 (12.2)
Had formal training in dental evidence	
Yes	131 (87.8)
No	18 (12.2)
Witness in the court to present forensic dental evidence	
Yes	143 (95.9)
No	6 (4.1)

DISCUSSION

Forensic odontology is an important branch of the study of dentistry that would assist in solving cases of abuses and deaths. Greater knowledge and awareness of forensic odontology among the dental practitioners would be required in the growing field of medicine. The practice of forensic odontology has gained importance in a number of developed countries across the world. [7]

Practicing dentists can become valuable members of the dental identification process by developing and maintaining standards of record-keeping, which would be valuable in restoring their patients' identity. In the present study, all dental practitioners maintain dental records whereas, in a study done by Preethi et al, 21% dental practitioners did maintain dental records in their clinic. Of the remaining 79%, only 12% maintained complete dental records. Ninety three percentages of the practitioners maintained the dental records for less than seven years.

As for knowledge or awareness about maintaining dental records, surprisingly a very low percentile of about 38% of surveyed dentists in Rajasthan maintained records and in another study done by Preethi et al, 17% dentists did not know of maintaining dental records.[8] However, in present study only 6.1% of dentists were not aware of maintaining dental records. Child abuse is presenting a serious social problem with global dimensions, increasing at an alarming rate in all socioeconomic strata and all ethnic or racial communities.

Teeth can also be used as weapon and, under certain circumstances, may leave information as to the identity of the biter.[9,10] As most of the abuse injuries occur in the head and neck, dentists can easily diagnose them. In the current study, only 10.2% dental practitioners did not know how to identify child abuse and just a few of them did not know the actions to be taken in cases of child abuse. Whereas, in a study done by Preethi et al, 40% dental practitioners did not know how to identify child abuse.

Age determination is done for various reasons such as of cadavers in criminal cases and in very mutilated victims of mass disasters. In living persons, the age estimation is done to assess whether the child has attained the age of criminal responsibility in cases such as

Table 4: Comparison and assessment of KAP responses according to the gender, qualification and experience of the dentists.

Variable	Gender			Qualification			Years of experience			P Value
	Male N=82(%)	Female N=67(%)	P Value	BDS N=82(%)	MDS N=67(%)	P Value	<5 N=98	5-10 N=39(%)	>10 N=12(%)	
Do you maintain dental records										
Yes	82(100)	67(100)	-	82(100)	67(100)	-	98(100)	39(100)	12(100)	-
No	0(0)	0(0)		0(0)	0(0)		0(0)	0(0)	0(0)	
Duration of maintaining dental records										
<3	70(85.1)	59(88.8)	0.612	67(81.7)	62(92.5)	0.875	89(90.7)	33(84.6)	11(87.8)	0.118
>3	12(100)	8(12.2)		15(18.1)	5(7.4)		9(9.4)	6(15.4)	1(12.2)	
Dental records are useful in identifying the deceased and crime suspects										
Yes	73(88.9)	67(100)	0.242	75(90.9)	65(96.3)	0.581	92(93.8)	36(92.3)	12(100)	0.853
No	9(11.1)	0(0)		7(9.1)	2(37)		6(6.3)	3(7.7)	0(0)	
Aware of the bite mark pattern of teeth										
Yes	82(100)	67(100)	-	82(100)	67(100)	-	98(100)	39(100)	12(100)	-
No	9(11.1)	0(0)		0(0)	0(0)		0(0)	0(0)	0(0)	
Had formal training in dental evidence										
Yes	76(92.6)	55(81.8)	0.388	71(86.4)	65(88.9)	0.789	89(90.6)	30(76.9)	12(100)	0.368
No	6(7.4)	12(18.2)		11(13.6)	7(11.1)		9(9.4)	9(23.1)	0(0)	
Aware of witness in the court to present forensic dental evidence										
Yes	79(96.3)	64(95.5)	0.882	78(95.5)	65(96.3)	0.882	98(100)	33(84.6)	12(100)	0.116
No	3(7.4)	3(4.5)		4(4.5)	2(0)		0(0)	6(15.4)	0(0)	
Aware of the lip prints for presenting dental evidence										
Yes	52(63.4)	55(82.1)	0.423	48(59.1)	55(81.5)	0.114	74(75)	24(61.5)	9(75)	0.260
No	24(29.3)	9(13.4)		30(36.4)	7(11.1)		21(21.9)	12(30.8)	0(0)	
Don’t know	6 (7.3)	3(4.5)		4(4.5)	5(7.4)		3(3.1)	3(7.7)	3(25)	

Test used: Chi square

rape, kidnapping, employment, illegal immigration, marriage and when birth certificate is not available and records are suspected.[11] Though 87.8% of the subjects claim to have undergone a formal training in dental evidence, it was surprising to see that 37.5% of the dental practitioners did not know how to estimate the dental age by examining the teeth; whereas, in another study 41% dental practitioners did not know how to estimate the age.[9,10] The reasons for this could be multifactorial, either their ignorance or lack of basic knowledge or lack of confidence in answering this question, apart from not knowing the significance of dental age with regard to forensics.

The identification of a large number of causalities in mass disasters is complex and fraught with hazards, both physically and emotions. For developing countries like India, dental identification is an appropriate method to consider in Disaster Victim Identification. In case of disaster victims, due to decomposition, only dental evidence or DNA may remain for comparison. With respect to cost, DNA is both much expensive and more time consuming. Experience in other disasters in identifying victims in countries like Estonia and Croatia has showed a high rate of dental identification.[11,12] In the present study, 87.8% of dental practitioner had formal training in collecting, evaluating and presenting dental evidence. However, the comparison of responses in relation to gender, qualification and years of experience was statistically not significant ($p>0.05$).

The idea of using lip print for identification was first suggested by Le Moyne Snyder in the year 1950.[13] It was during the period 2000-2012 that the various studies were carried out by several researchers from other countries and also in India.[14] Different aspect of lip prints like stability, morphological patterns and sex determination were studied among different groups of population. So the research suggests that cheiloscopy can be used as an adjuvant technique in identification.[15] In the present study, awareness of the lip prints for presenting dental evidence among dental practitioners were 71.4%. The observations of this study indicate that there is lack of practice of forensic odontology among majority of the study participants. This could be due to various reasons like there are no fully equipped laboratories for forensic odontology in India. The other reason could be their busy dental practice, which doesn't allow them an opportunity to probe deeper into the forensic odontology. Further, Forensic odontology was not included as a part of the academic curriculum until recently.

CONCLUSION: The current study clearly shows that there is an adequate knowledge and good attitude among dental practitioners regarding Forensic Odontology in Kanpur City.

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