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Awareness of Forensic Odontology among Dentists in Chitwan

Santosh Koirala[1], **Abhishek Jha**[2], **Chhime Lama**[2], **Rajib Chaulagain**[3]

[1]Department of Forensic Medicine, Chitwan Medical College, Bharatpur, Nepal, [2]Private Dental Practitioner, Bharatpur, Nepal, [3]Department of Health Research, Madhesh Institute of Health Sciences, Janakpurdham, Nepal.

ABSTRACT

Background

Through the analysis of dental remnants, forensic odontology contributes significantly to forensic investigations by offering insightful analysis and useful evidence. But dental professionals' awareness and degree of understanding about forensic odontology can have a big impact on how well it works in medico-legal matters. The study was aimed to assess the awareness of forensic odontology among the dentists of Chitwan.

Methods

A descriptive cross-sectional study was conducted among the dentists of Chitwan from 1st Sept, 2024 to 30th Sept, 2024. This study used self-administered questionnaire to assess the study objectives related to forensic odontology. The self-complete questionnaire collected details on participants' sociodemographic and primary practice characteristics, exposures and experiences in forensic odontology, awareness of the activities of forensic odontology and their record keeping. The collected data were entered into Microsoft Excel and later transported into SPSS version 16 and then analyzed for descriptive statistics.

Results

A total of 110 dentists with the mean age of 27.35±5.20 years participated in the study. Majority of the dentists were aware regarding forensic odontology and its role in mass disaster. Approximately 88 (77.3%) of the participants believed that both radiographic examination and eruption patterns were the best ways to estimate dental age. Radiographs, investigation results and patient information were among the various items that were recorded by all the participants.

Conclusions

The study concluded that all of the dentists were aware about forensic odontology. Lack of practice in maintaining dental records was observed. The records were also not maintained for longer periods. With time, this study focusses, the need of refresher courses for update of knowledge of forensic odontology.

Keywords: awareness; dentists; dental records; forensic odontology.

INTRODUCTION

The identification of people and their remains during natural calamities and man-made disasters, as well as victims in forensic cases and conflicts, is a significant challenge.[1-3] Forensic experts utilize various methods and items for identification, including clothing, ornaments, fingerprints, footprints.[4] Forensic odontology is area of dentistry that deals with the appropriate handling, examination, and preservation of dental findings in the interest of justice.[5, 6] Compared to the common way of estimating age from height at the time, teeth gave the most accurate reference to age.[6, 7] Forensic experts also use tooth and other parts of oral cavity for identification.[9, 10] Dental professionals' knowledge in forensic odontology is crucial in identifying victims of natural and man-made disasters.[11, 12] The study was intended to assess the awareness of forensic odontology among the dentists of Chitwan.

METHODS

A descriptive cross-sectional study was conducted from 1st Sept, 2024 to 30th Sept, 2024, among the

Correspondence: Dr. Santosh Koirala, Department of Forensic Medicine, Chitwan Medical College, Bharatpur, Nepal. Email: santoshkoirala427@gmail.com, Phone: +977-9851147241. **Article received**: 2024-11-29. **Article accepted**: 2025-02-15. **Article published**: 2025-03-31.

dentists of Chitwan, Nepal. The ethical clearance for the study was obtained from the the Chitwan Medical College Institutional Review Committee (Ref. no. CMC-IRC/081/082-011). The study included dentists who were practicing dentistry in Chitwan and willing give consent. An online self-administered questionnaire was used to assess the study objectives related to forensic odontology. In order to conduct the study, a literature search was carried out. Relevant questions pertaining to awareness about forensic odontology from previously published studies were used.[1, 2, 4, 7, 8, 13, 14] The content validity of the questionnaire was done with 7 experts in the field to evaluate the relevance and clarity of the content. All the experts had more than 5 years of experience. Experts evaluated questions and made minor corrections in some questions. The questionnaire was pretested among 15 dentists who were not from study settings to determine if the response to the question was clear and had no misinterpretation. Depending upon the results of pretest, minor changes were made and the final draft was prepared. The findings from pretest were not included in the study. Then the final questionnaire was prepared by using Google form, given to the all the participants through online media such as Viber, Facebook messenger. The invitation to participate package contained Participants' Information Sheet, informed consent page and then the questionnaire. Each respondent was only able to open after clicking on the informed consent page.

The questionnaire contained two parts. The first part dealt with the respondents' sociodemographic details; the second part was related to awareness of forensic odontology. An email reminder was sent 2 weeks after the first invitation email. Questions were designed as close ended types. The closed-ended questions contained either multiple choice questions or single choice type to allow respondents to specify their level of agreement or disagreement to the statements. The collected data was collected in spreadsheet format and were entered into Microsoft Excel and later transported into SPSS version 16 and then analyzed for descriptive statistics.

RESULTS

The study included 110 dentists, with a mean age of 27.35±5.20 years. The majority of participants were females 69 (62.9%). More than three-fourth of participants were undergraduates 99 (90%) (Table 1).

Table 1. Demographic characteristics of participants.

Variables	Frequency (%)
Mean Age (years)±SD	27.35±5.20
Sex	
Male	41 (37.3)
Female	69 (62.7)
Education	
BDS	99 (90.0)
MDS	8 (7.3)
Others	3 (2.7)
Mode of practice	
Private practice in own clinic	14 (12.7)
Employed in private clinic/hospital	15 (13.6)
Working in an educational institute	77 (70.0)
Working in governmental hospital	4 (3.6)
Experience	
1-5 years	101 (91.8)
5-10 years	5 (4.5)
10-15 years	4 (3.6)

Regarding awareness of forensic odontology, majority of participants108 (98.2%) were aware about the role of forensic odontology in mass disaster. About 104 (94.5%) of the participants knew tooth as a source of DNA. More than 100 participants knew about the meaning of Cheiloscopy 102 (92.7%) and 90 (81.8%) were aware about the different patterns of lip prints. About 88 (77.3%) of the participants opined that radiographic examination and eruption pattern were the methods of dental age estimation. While 32 (29.1% were in the view that saliva was the best source of DNA in oral cavity, about 10 (9.1%) and 68 (61.8%) said smear and pulp as best DNA source respectively. About 68 (61.8%) opined rugae as best-preserved soft tissue landmark for forensic analysis while 103 (93.6%) knew the significance of bite mark patterns of teeth. Regarding testifying as an expert witness in court to present forensic dental evidence (dental records), about 90 (81.8%) knew the role of dentists. However, only 39 (355.4%) reported that they were confident on giving an opinion on forensic odontology (Table 2).

Table 2. Awareness about forensic odontology.		
Variables		**Frequency (%)**
Forensic odontology plays role in mass disaster	Yes	108 (98.2)
	No	1 (0.9)
	Do not know	1 (0.9)
Teeth as a source of DNA	Yes	104 (94.5)
	No	5 (4.5)
	Do not know	1 (0.9)
The most accurate and sensitive method to identify an individual	Finger prints	19 (17.3)
	Teeth	2 (1.8)
	DNA	49 (44.5)
	All of the above	40 (36.4)
Cheiloscopy is a study of	Lip prints	102 (92.7)
	Bite marks	1 (0.9)
	Do not know	7 (6.4)
Awareness of different pattern of lip prints	Yes	90 (81.8)
	No	16 (14.5)
	Do not know	4 (3.6)
Step in comparative dental identification	Comparing post and antemortem dental record	73 (66.4)
	Asking patient relatives	1 (0.9)
	All of the above	33 (30.0)
	Do not know	3 (2.7)
Tooth numbering system you use most	FDI notation	62 (56.4)
	Zsigmondy palmer notation	36 (32.7)
	Universal notation	12 (10.9)
Estimation of the dental age of an individual by examining the teeth	Radiographic examination	8 (7.3)
	Eruption pattern	17 (15.5)
	Both	85 (77.3)
Teeth which are found in skeletal remains provide information regarding	Genetic origin	22 (20.0)
	Sex	2 (1.8)
	Age	15 (13.6)
	All of the above	71 (64.5)
Estimate the age of an individual in edentulous patients	Yes	64 (58.2)
	No	10 (9.1)
	Do not know	36 (32.7)
Best source of DNA in the oral cavity	Saliva	32 (29.1)
	Smear	10 (9.1)
	Pulp	68 (61.8)
Best preserved soft tissue landmark for analysis	Lip print	39 (35.5)
	Rugae pattern	68 (61.8)
	Tongue print	3 (2.7)
Mostly used to determine the age of a person from skeletal remains with teeth	Secondary dentin deposition	58 (52,7)
	DNA	23 (20.9)
	Cementum annulations	16 (14.5)
	Enamel translucency	13 (11.8)
Significance of bite mark patterns of teeth	Yes	103 (93.6)
	No	6 (5.5)
	Do not know	1 (0.9)
A dentist can testify as an expert witness in court to present forensic dental evidence (dental records)	Yes	90 (81.8)
	No	11 (10.0)
	Do not know	9 (8.2)
Received any formal training in collecting, evaluating and presenting dental evidence	Yes	4 (3.6)
	No	106 (96.4)
Confidence in giving an opinion on forensic odontology	Very Confident	5 (4.5)
	Confident	34 (30.9)
	Not confident	53 (48.2)
	No idea	18 (16.4)

Table 3 showed awareness of dentists on maintenance of dental records. About 96 (87.3%) were aware of maintenance of dental records. Among the different items recorded, all of the dentist recorded radiographs, investigation findings and patient details. About 68 (61.8%) said they recorded dental records for less than 5 years. Regarding barriers of maintaining dental records, lack of time, lack of qualified staff and increased work load were the barriers to maintain dental records.

Table 3. Awareness regarding maintenance of dental records.

Awareness of maintenance of dental records	Frequency (%)
Maintenance of dental records	
Yes	96 (87.3)
No	14 (12.7)
Dental records-maintained items*	
Photographs	72 (12.0)
Radiographs	110 (18.3)
Study Casts	89 (14.8)
Investigation findings	110 (18.3)
Patient details	110 (18.3)
Duration of maintenance of dental records	
Less than 5 years	68 (61.8)
More than 5 years	42 (38.2)
Barrier to maintaining dental records*	
Lack of time	43 (18.9)
Lack of qualified staff	86 (37.9)
Increased workload	98 (43.2)

About 93 (84.5%) said they received formal education in forensic odontology, all of them opined the importance of education on forensic odontology education in BDS course. However, only 5 (4.5%) attended workshops on forensic odontology. Majority of the participants reported that BDS education and books were major source of knowledge of forensic odontology (Table 4).

Table 4. Source of information about forensic odontology.

Source of information	Frequency (%)
Received formal education in forensic dentistry	
Yes	93 (84.5)
No	11 (10.0)
Do not know	6 (5.5)
Important of education on forensic dentistry in BDS course	
Very important	110 (100)
Attended any workshops regarding forensic odontology	
Yes	5 (4.5)
No	105 (95.5)
Source of your knowledge about forensic odontology*	
BDS Education	110 (32.3)
Specialized course	11 (3.2)
Books	110 (32.2)
Journal	18 (5.3)
Internet	92 (27)

**Multiple response*

DISCUSSION

Forensic odontologists have a great role in identifying human remains through the dental records, in determining the age and gender of the deceased and also providing expert witness in the court to present the dental evidence. In situation where bite marks or physical injuries indicate abuse to the child or adult, forensic odontology plays a vital role.[15-17] The study showed the status of awareness of dentists regarding forensic odontology and its utility in their clinical practice among the dentists of Chitwan. A critical question arises whether dentists should be trained and educated in forensic odontology. At times dental identification is a trustworthy way to identify a victim or suspect. In recent years, disasters, both men-made and natural, have increased.[1, 2] The bodies of the victims are severely deformed in these disasters and the dentists or forensic odontologist are important in identification.[18] In the present study almost all the dentists knew forensic odontology plays role in mass disaster. Similar result was also shown by Khalifa et al in their study.[4] A person's dentition status is important in forensic for identification.[8] There are thirty-two teeth in jaws of an adult human dentition; however, there can be variations different types in each individual such as teeth can be congenitally missing, deformed. The race and ethnicity also impose another variability.[6, 7] In the present study 94.5% of dentists believed teeth as a source of DNA. Giannakopoulos et al showed only 85% of the respondents knew teeth as a source of DNA.[7] In sharp contrast to our study in a study conducted in Saudi Arabia, 40% of the graduates' reported teeth as a source of DNA.[14] The differences across the country may be due to their

specific curriculum and its implementation. Teeth are also a source of dental age estimation. At times teeth also gave the most accurate reference to age. Dental profiling is also dependent upon individual's age, which helps in identification person's age.[9] Because of the variation in tooth emergence and formation, dental age estimation is based on chronological age which has been widely used to establish an individual's age.[10]

Lip patterns are in a way unique in all individuals and vary from each other and similar is the case of rugae pattern.[4] Rugae pattern is well preserved inside the oral cavity even in case of burn victim.[19] In the present study 61.8% of the dentists were aware that rugae was well preserved soft tissue landmark. Age of a person can not only be estimated from external appearance, but also from the changes in the dental hard tissue with ageing such as from the occlusal wear patterns, secondary dentin deposition, thickness of dentin.[3] In the present study 52.7% of the respondents were in agreement that the most used method for determining an individual's age was secondary dentin deposition.

A dental record is an official, comprehensive document that records and individual details that occur in a dental office, from treatment to instructions for care at home and also consent to the treatment. It is crucial for the proper patient care, communication and a way for personal identification in disasters. Maintaining the complete dental records not only protects dentists from medico-legal problems but also ensures a secure and an efficient dental practice.[15] Furthermore, a dentist can testify as an expert witness in court to present forensic dental evidence (dental records). The dental records are not only kept for forensic utility but they are also a valuable asset for the dentists for future reference.[10, 20] Thus there is necessity for dentists to have awareness for maintenance of dental records. In the present study about 87.3% of the dentists were aware of maintenance of dental records which was similar to the study Ali et al.[10] where 80% of the participants maintained records. In agreement with the present study conducted among Croatian dentists, Pavicin et al revealed almost 87% of the dentists maintained dental records.[6] Being aware to keep records is excellent, however, it should be aligned with good practice methods to keep records. Gupta et al. in their study showed only 22% of the dentists were maintaining dental records.[21]

There was also a disagreement regarding how longer periods the dental records should be kept, what were the barriers associated and what are the items to be kept as records. In dentistry it is only orthodontic department where dental records are kept for longer period of time.[6] The most common items kept are dental casts, radiographs and patient treatment log. In a study conducted by Pavincin et al. 94 % of the participants kept dental casts, while 93% kept dental digital documentation methods.[6] In the present study photographs, radiographs, study casts and patient treatment log were commonly recorded items. However, 68 (61.8%) were in agreement that they kept dental records for less than 5 years. The barriers associated were lack of time and qualified staffs and increased work load in keeping records. The difference in the time line of keeping records may reflect the care dentists provide to dental records and the educational barriers to forensic odontology. Navya et al, revealed inadequacy of knowledge of forensic odontology among general dental practitioners.[1] Preethi et al also showed that 17% of the practitioners were not aware of maintaining dental records.[22] in part dentist can have strong knowledge and attitude but there may be situation they may lack that knowledge in pure clinical practice. Similar results were shown by Nagarajappa et al. in their study conducted in Kanpur.[13] The present study also has limitations to come into conclusion as its objective was only to assess awareness. The situation in different study revealing variety of results of keeping dental records portray the current situation of dental education system and its reflection on forensic odontology. The results show dentists might need further training on forensic odontology. The present study showed all the dentists knew the importance of forensic odontology and that too they received in BDS education, however, only 4.5% of them attended workshops on forensic odontology. Many dentists may not opt to take forensic odontology as a career,

but at least they should know the medico-legal aspect and importance of forensic odontology. In the context of Nepal, forensic odontology is a novel field with broad application. At times in case of mass disaster, dentists have been a boon in victim identification.[23] With time there has been increase in criminal cases, natural and man-made disasters. The study also urges for strong implementation with much emphasis of forensic odontology in Nepali BDS curriculum. The study has its own limitation. First of all, the study was conducted among dentists of Chitwan so it has its own limitation of generalizability. The second limitation was only awareness domain was studied. The third limitation is small sample size.

CONCLUSIONS

It was concluded that every dentist who participated in this study were aware about forensic odontology. It was noted that dental records were not maintained and not kept for longer periods of time. This study also focuses on the necessity of refresher courses on forensic odontology for update of knowledge.

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