Review Article

Knowledge and awareness of forensic odontology among dentists in India: A systematic review

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Abstract

Forensic dentistry involves the processing, review, evaluation, and presentation of dental evidence with the purpose of contributing scientific and objective data to legal processes. The present, systematic review was conducted to assess knowledge and awareness of forensic odontology among dentists in India. A systematic review of relevant cross-sectional studies was conducted regarding the level of knowledge, awareness, and practical application of forensic odontology among dentists in India. Four out of 129 studies were finally included in the present review after conducting a search of both electronic and manual scientific databases. Potential biases were addressed and the relevant data were extracted by the concerned investigators. Almost all the subjects were familiar with the subject of forensic odontology in one of the study reports. Only 12% of dentists were maintaining complete dental records in the findings of another study. Only 4% of dentists reported to have contributed to the identification of victims in a mass disaster in yet another study. The findings of another study revealed that 40% of dental practitioners did not have the expertise to identify child abuse. The results of the present review showed that the knowledge and awareness level of subjects was inadequate and that there is considerable variation in the practice of forensic odontology among dentists. It is necessary to expose dentists to the basic principles and techniques of the subject.

Key words: Awareness, dentists, forensic odontology, knowledge, practice

Introduction

The term "forensic" has its origin in the Latin word "forensis" from "forum," which means a place where legal matters are discussed.[1] The science of dentistry as related to the law is known as forensic dentistry or forensic odontology.[2] Forensic odontology is a specialized field of dentistry related to legal problems. It is one of the most rapidly developing branches of forensic medicine and forensic science.[3] Forensic odontology can be defined as the branch of dentistry that addresses the proper handling and examination of dental evidence and the evaluation and presentation of dental findings in the interests of justice.[4] This relatively small specialty within the forensic sciences has been utilized for many years, principally in the area of establishing identity in natural and manmade disasters.[4]

Interest in forensic dentistry was relatively dormant until the 1960s when renewed interest was sparked by the first formal instructional program in forensic dentistry given in the United States at the Armed Forces Institute of Pathology.[5] Since then the number of cases reported has expanded to such an extent that the term "forensic

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odontology" is becoming familiar not only to the dental profession but also to law enforcement agencies and other forensic groups.[6] The first forensic dental identification in India was reported in a review conducted by Sansare and Dayal in 1995.[7] According to this review, M. Raja Jayachandra Rathore of Canouj, died on the battlefield in 1191. His body was identified by his false anterior teeth. This was probably the first case of identification using dentition from India.

Forensic odontology has become an integral part of forensic medicine over the past 100 years.[8] It may also be subclassified into forensic-odonto-toxicology, which deals with cases of poisoning, but this field is yet to gain popularity globally.[9] Forensic odontology plays an important role in criminal, monetary disputes, marital, social, burial, and the identification of individuals missing for prolonged periods.[4] Identification plays an important role in civil cases like insurance claims, matrimonial disputes, property disputes, impersonation, and issue of passports and various licenses.[10] A general dentist apart from having a broad background knowledge of general dentistry, should also possess basic knowledge of the role of the forensic pathologist, methods used in autopsy, the role of a dentist in the identification of a person, and the importance of maintaining dental records of all patients.[9] Unfortunately, in India, qualified forensic odontologists are very few.[4] This is probably due to the lack of proper awareness; neither the government nor the people have completely understood the role that can be played by a forensic dentist.[3] Therefore, the present systematic review was conducted on the available literature to report on:

- Knowledge and awareness of forensic odontology among dentists in India
- Aptitude and status of the practice of forensic odontology among dentists.

Materials and Methods

Eligibility criteria for the studies

The present systematic review was carried out to ascertain the knowledge and awareness of forensic odontology among dentists in India. Study selection was based on the following inclusion criteria: (1) Studies conducted in India; (2) subjects limited to dental professionals in India; (3) published in the English language; (4) studies evaluating the knowledge and awareness of forensic odontology as outcome measures; and (5) observational cross-sectional studies. No limitation in terms of publication date was considered in the search strategy.

The studies that were excluded from the present review were: (1) Studies not conducted in India; (2) reviews; and (3) studies on health professionals other than dentists. Initial electronic and manual searches at the Post Graduate Institute of Medical Education and Research (PGIMER) Library, Chandigarh and the National Medical Library, New Delhi on forensic odontology in India yielded 129 references, and only four were retained. Full texts of all the four articles were extracted electronically and manually.

Identification of relevant studies

The present review of literature was carried out both electrically as wells as manually. The search strategy is depicted in Figure 1. The present review was carried out based on this protocol, and guidelines have been used for its preparation.[11] 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," and "India". We identified 129 papers with this method. Various key words utilized in the search strategy included- forensic odontology, knowledge, attitude, practice, dentists, India, dentistry, dental professionals. Various combinations of key words were made using "and" and "or" as Boolean operators. Experts in the concerned field and authors of selected studies were also contacted for obtaining missing or unclear data whenever deemed essential.

Selection of studies

Two authors Ramandeep Singh Gambhir and Gurminder Singh independently identified studies that were then included in the present review. 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, though their reference lists were searched in turn for any studies not retrieved by the electronic search. 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.[12]

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 reporting information regarding

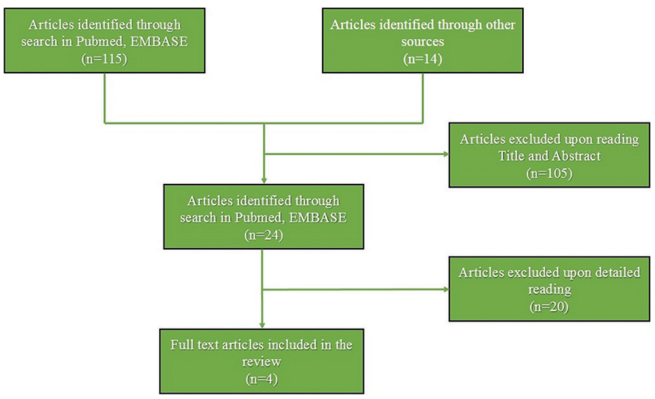

Figure 1: Flow diagram of identification of studies for inclusion

biomedical waste management, (2) selective outcome reporting, (3) choice of outcome measures (knowledge or awareness levels, and aptitude or status of practice of forensic odontology), (4) study design, and (5) conflict of interest in the conduct of the study. When all criteria were met, the overall plausible risk of bias was estimated to be low.

Collection and extraction of data

This review was done according to the guidelines set forth by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).[13] Two of the authors Puneet Singh Talwar and Jaskaran Gambhir were given the responsibility of extracting data from the studies. Prespecified data were extracted from each of the studies including the study design, sample size, practices regarding forensic odontology among the study subjects, awareness and knowledge of forensic odontology or dentistry, and other study characteristics. Any kind of disagreement regarding article screening and extraction was sorted out by the other author Vaibhav Munjal.

Results

Description of selected studies

The original search identified 129 studies but only four studies were potentially eligible for the present systematic review after performing the necessary exclusions.[14-17] The study population in two of the studies comprised entirely of private dental practitioners as compared to two studies where academicians and dental specialists like oral pathologists also comprised the study population [Table 1]. All the four studies were conducted in four different Indian states (Uttarpradesh, Madhya Pradesh, Karnataka, and Tamil Nadu). All the studies were cross-sectional in nature and used a close- or open-ended questionnaire for gathering the relevant data regarding forensic odontology from the study subjects.

Knowledge regarding forensic odontology

Figure 2 depicts the knowledge of dentists regarding forensic odontology on the basis of various questions asked among the subjects in different studies. Almost all the subjects were familiar with the subject of forensic odontology in the study reports of Shetty and Raviprakash[16] compared to other studies. Only two studies identified the source of knowledge of the subjects regarding forensic odontology.[15,16] More than 50% of the subjects practicing in the metro area cited journals as their main source of knowledge, whereas internet and newspapers were cited as the main sources of knowledge by dentists who were practicing in tier-2 cities.[13] Journals were read by only 48% of dentists in the other study.[16]

Maintenance of dental records

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. Only two studies gathered information on the maintenance of

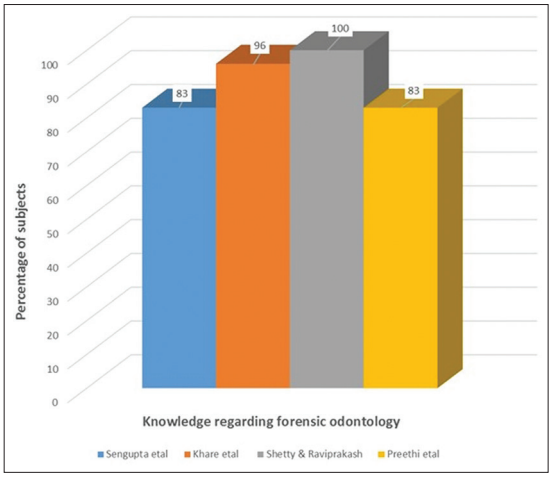

Figure 2: Knowledge regarding forensic odontology among different study subjects

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

Authors	Year of publication	Study population	Sample size	Study setting	Study area	Outcome measure	Results
Sengupta *et al.*[14]	2014	Practicing dentists	100	Urban	Uttar Pradesh	Maintenance of detailed dental records for victim identification	Most of the dentists were familiar with the subject but only a few of them maintained and shared dental records
Khare *et al.*[15]	2013	Dental practitioners and academicians	774	Urban	Madhya Pradesh	Awareness and knowledge of forensic odontology	There was low knowledge among the respondents about the application of forensic odontology in routine practice
Shetty and Raviprakash[16]	2011	Oral pathologists	120	Urban	Karnataka	Confidence in handling and practical exposure to forensic cases, knowledge and awareness, training in forensic odontology	There was lack of confidence among the subjects about handling forensic cases due to various reasons
Preethi *et al.*[17]	2011	Dental practitioners	322	Urban	Tamil Nadu	Knowledg, attitude and practice of forensic odontology	There was inadequate knowledge, poor attitude, and lack of practice of forensic odontology prevailing among the subjects

dental records by the dentists.[14,17] Dental records were maintained by 86% of dentists in the study conducted by Sengupta *et al*.[14] and 36% were scared of the misuse of records when called for the identification of victims in mass disasters. According to the study reports of Preethi *et al*.[17] 79% of dentists maintained dental records and out of that percentage, only 12% of the dentists maintained, complete dental records.

Solving cases/formal training related to forensic odontology

Solving cases related to forensic odontology among different study subjects is depicted in Figure 3. Very few dentists had prior experience in solving cases related to forensic odontology in all the studies. Only 4% of subjects in the study findings of Sengupta *et al*.[14] reported to have contributed to the identification of victims in mass disasters and approximately the same percentage of subjects had contributed toward solving cases related to forensic odontology (more so in metros compared to tier-2 cities) in the study reports of Khare *et al*.[15] Only 7% of study participants were exposed to formal training in forensic odontology in the study reports of Shetty and Raviprakash.[16]

Cases related to sexual/psychological/physical abuse of a child

According to study reports of Sengupta *et al*.[14] cases related to child abuse in metros were less than in tier-2 cities. Moreover, steps taken to solve child abuse cases were more in tier-2 cities as compared to metro areas. The findings of the study conducted by Preethi *et al*.[17] revealed 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, clothing, etc., Again 60% of dentists agreed on parental/child counseling and reporting to the child care authorities in case of any incident in the same study. the rest of the studies did not gather any information on these issues from their subjects.

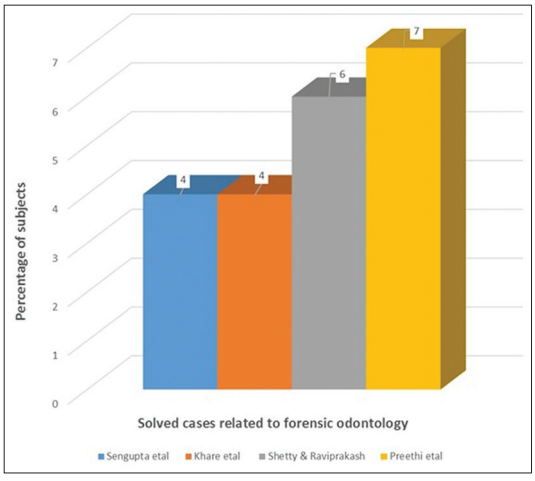

Figure 3: Solving of cases related to forensic odontology by subjects in different studies

Discussion

The focus of the present systematic review is on the knowledge, awareness, and practice of forensic odontology among dentists in India. The review utilized various parameters in order to gather important information from dentists and other specialists on the topic of forensic odontology, which is evident from the results. 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 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,[14-17] while only one study used a questionnaire that contained both open- and close-ended questions.[17] 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[16] 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. Scientific journals were cited as the main source of knowledge among a major proportion of subjects practicing in metros, whereas dentists in tier-2 cities mainly depended upon the newspaper for the same in one of the studies.[15] This could be due to the easy access of journals to the dentists who are residing in metros.

Forensic dental investigation mainly depends upon the availability of antemortem records and therefore dental records prove to be a very useful tool in such cases.[18] These are also maintained for consumer court evidence and for dental insurance. Only 12% of dentists maintained complete dental records in one of the study reports.[17] 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 present review had some limitations as well. It was based on a review of earlier studies that were conducted in different time periods by different authors. Therefore the generalizability may be inaccurate. Also some of the articles that passed the inclusion criteria during the initial search were available only on payment; mails were sent to the journals/authors requesting a waiver of the same

but no response was received, as the present study was not funded, these articles could not be included. The present review compared and discussed only those aspects regarding forensic odontology that were common in all the studies as it was not practically possible to discuss and compare dissimilar characteristics of each and every study. Moreover, the sample in each study comprised different type of subjects: One study compared the knowledge levels of practitioners and academicians,[15] while other studies engaged dental practitioners and specialists like oral pathologists.[16] Therefore, this type of sampling could account toward the different levels of knowledge and awareness found in the study.

The present systematic review involved the electronic and manual search of multiple scientific databases, with no restriction regarding year of publication. The reference lists of literature reviews were searched for other studies that could also be included. However, it is possible that some relevant data may have been omitted in terms of fugitive literature (conference proceedings, dissertations, technical reports, etc.). 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.

Conclusion

The results of the present review showed that the knowledge and awareness level of the subjects was inadequate, with considerably low attitude and practice scores. The respondents had little knowledge about the practical application of forensic odontology in routine practice. To maximize dental application in forensic cases, it is necessary that dental practitioners should know the basic principles and techniques of the subject. 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.[19] Moreover, all the studies on knowledge and awareness levels regarding forensic odontology were conducted in urban areas. Therefore, the authors recommend similar studies involving dentists in rural settings and in other states of the country so that more valuable data can be accumulated.

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