

Pakistan's position in the world of forensic odontology and dental records

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ABSTRACT

Background: Forensic Odontology (FO) still strives for recognition in some countries such as Pakistan. Natural and man-made disasters, along with child abuse cases and age estimation for child marriages and juvenile imprisonments in Pakistan justify its applicability.

Aims: This study investigated the awareness, information, training, practice and interest in FO in dental professionals in Pakistan. Another aim was to design tools to deliver primary knowledge about FO and emphasize the importance of dental records.

Methodology: A 10 question paper-based survey was distributed among 560 dental professionals and postgraduates of 14 public dental institutes/hospitals in Pakistan. The results were quantitatively analyzed by graphs using Microsoft Excel (version 16.22). An educational video and an information leaflet were produced after the survey was undertaken to explain the scope of FO and the importance of dental records respectively.

Results: 476 dentists (51% ♀, 49 % ♂) aged 20 – 50+ years responded and 98.53% confirmed that FO was not taught in the dental schools. 66% were aware of the field and 62% were only informed. 99% were not trained and 89.7% were not working in this field; however, 89% were interested in training within Pakistan. Considering dental charts, 60.92% do not produce detailed charts but 55% maintain them and the majority do so manually. Radiographs were the most stored type.

Conclusions: Most dentists are aware of the existence of FO, but they need to acknowledge the significance of dental record keeping and encourage implementation of FO. Regardless of the absence of any governing body for FO and negligible education, training and implementation in Pakistan, this field is gradually progressing. The authorities should introduce detailed guidelines for recording, managing and storing dental records. They should ensure the future acknowledgement of this subject in the education system and assign forensic odontologists to the Disaster Victim Identification (DVI) team.

INTRODUCTION

The disciplines of Forensic Odontology (FO) include age estimation, bite mark analysis, litigation against dental malpractice/dental fraud and most importantly human identification. Teeth are resilient to conditions such as high temperatures, immersion and decomposition and are classified

as one of the primary identifiers by Interpol. Moreover, teeth are the cheapest, quickest and easiest methods of human identification when compared to fingerprinting and DNA (1).

In Pakistan, FO as an educational subject and as a practising field is limited and is still struggling to establish itself. In a country of 207.774 million people and 2,040 dentists registered as specialists in 2018 (2) there is only "one" dentist who is registered as a Forensic Odontologist with the Asia-Pacific Forensic Odontologist (APFO) group. Pakistan, being a developing country and prone to natural disasters, is in drastic need to educate and train more professionals in the field. Even though many Asian countries are working on advancements in this field and have their DVI units which include forensic odontologists, Pakistan has been limited to only a handful of cases of age estimation and human identification in which FO has been used. Except for those cases, none of the extra measures (practical or academic) has been taken in this field within the country to date.

Every dentist is obliged to record complete dental details of the patients, as dental records

are legal documents (3) and might be required for human identification and cases of malpractice or fraud. Hence, the dentists in Pakistan should acknowledge the significance of dental records and they should learn comprehensive dental data recording, storing and updating protocols. This study investigated the awareness, information, training, practice and interest of FO among the dental professionals in Pakistan. Another aim was to design tools to deliver primary knowledge about FO and emphasize the importance of dental records respectively.

METHODOLOGY

Survey

A 10 question paper-based survey was distributed among 560 dental professionals and postgraduates of 14 public dental institutes/hospitals in Pakistan, which were selected randomly. The dentists were provided with a brief introduction to the project. Details such as age, sex, clinical experience and name of the institution/hospital were required. All questions (Q) were closed-ended apart from Q2, Q4 and Q9 as seen in Table 1.

Table 1. Questions and respective categories of the survey

Questions		Category of the questions
Q1	Please select the subjects which you were not taught in your dental school.	Education, awareness and information of Forensic Odontology
Q2	Have you heard about Forensic Odontology? If yes, when and how?	Forensic Odontology
Q3	As per your knowledge, which sub-topics from the following do you consider to be specifically related to Forensic Odontology?	Forensic Odontology
Q4	Have you received any professional training in Forensic Odontology?	Training and working in Forensic Odontology
Q5	Have you ever worked or assisted a Forensic Dentist, or have you ever given an opinion in a case related to forensics?	Training and working in Forensic Odontology
Q6	Do you make a detailed dental chart (current status of the dentition/treatment plan) of every patient you attend?	Transcribing, recording, and maintaining the dental data
Q7	Do you or the hospital maintain the dental records of your patients? If yes, choose one method and duration of storage?	Transcribing, recording, and maintaining the dental data
Q8	Please select the type of record regularly maintained by you or the hospital.	Transcribing, recording, and maintaining the dental data
Q9	According to your opinion, choose the appropriate statement in regard to the need of forensic odontology in our country	Need and interest of FO
Q10	Would you be interested to be trained as Forensic Odontologist within	Need and interest of FO

This survey was distributed by road travel in 2 phases, which ranged from July 2018 – August 2018 and December 2018 – January 2019 respectively. The names of these dental institutes, along with their specific provinces are seen in Table 2.

House officers, interns, dental technicians, nurses or assistants, undergraduate students and any dental professionals or postgraduate students working in private dental institutes were excluded from the inclusion criteria.

Table 2. Names of the institutes and the respective provinces for data collection

Provinces	Names of Dental Institutes
SINDH	(1)Dental Section, Karachi Medical & Dental College, Karachi. (KMDC); (2) Dental Section, Liaquat University of Medical and Health Sciences, Jamshoro (LUMHS); (3) Dental Section, Dow International Dental College, Karachi. (DIDC); (4) Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Karachi. (DIKIOHS); (5) Sindh Institute of Oral Health Sciences/JSMU, Karachi. (SIOHS/JSMU); and (6) Bibi Asifa Dental College, Larkana. * (BADC)
BALUCHISTAN	(1)Dental Section, Bolan Medical College, Quetta. * (BMC)
PUNJAB	(1)De'Montmorency College of Dentistry, Lahore. (De'monte); (2) Nishtar Institute of Dentistry, Multan. (NID); (3) Dental Section, Punjab Medical College, Faisalabad. (PMC)
PUNJAB	(1)Dental Section, Army Medical College, Rawalpindi (AFID)
KHYBER PAKHTUNKHWA	(1)Dental Section, Ayub Medical College, Abbottabad. (AMC); (2) Khyber College of Dentistry, Peshawar. (KCD); and (3) Bacha Khan Dental College, Mardan. (BKDC)

The results were analysed quantitatively using Microsoft Excel (version 16.22)

An Educational video

An educational video of 2 minutes 44 seconds in English language with subtitles in Urdu language was filmed within the premises of the School of Dentistry in Dundee, Scotland. This video was uploaded on YouTube after the participants filled the questionnaires. It answers two questions (a) *What do the Forensic Odontologists do?* And b) *How can the general dentists help Forensic Odontologists?* and can be viewed at: <https://www.youtube.com/watch?v=y12JxtlFERo>.

The information leaflet

An information leaflet was designed using Microsoft Publisher© to explain the reason for the use of teeth in human identification, the role of Forensic Odontologists and the types and importance of dental records. It was to be distributed among the dental professionals and dental students after the study was completed. It

can be found at: <https://drive.google.com/file/d/1C2FoM-9ztIjITuqsjpiP3l9TUCBVRClq/view>.

RESULTS

A total of 560 questionnaires were distributed, to which, 476 dentists 49%M and 51%F from the age range of 20 years to 50+ years responded (response rate= 85%) as seen in Figure 1.

Most of the dentists had a work experience of “1-3 years” (22.69%) followed by “3-5 years” (17.23%), “5-7 years” (14.50%) and “12-20 years” (13.66%). The experience of the 4.41% dentists who selected the option “OTHER” varied from 21 years to 35 years. 469 dentists (98.53%) selected FO as a subject not taught in their dental schools, followed by other options as seen in Figure 2.

When asked if they have heard about FO (Q2), 314 dentists (66%) responded “YES” contrary to 161 (34%). Out of these 314 dentists, 126 (40%) selected the option “more than 5 years ago”, “more than 3 years ago” (24%), “1-2 years ago” (22%), “within last 1 year” (14%) and 2 dentists did not answer.

To state the sources of awareness about FO, the dentists could select more than one option such as “through colleagues” (36%), “seminars/

workshops” (34%), “social media” (30%) and “Professors” (29%). 19% selected ‘OTHER’ as seen in Figure 3.

Figure 1. Count of dentists segregated based on the institutes and the age groups. (x= count of dentists, y= names of the institutes)

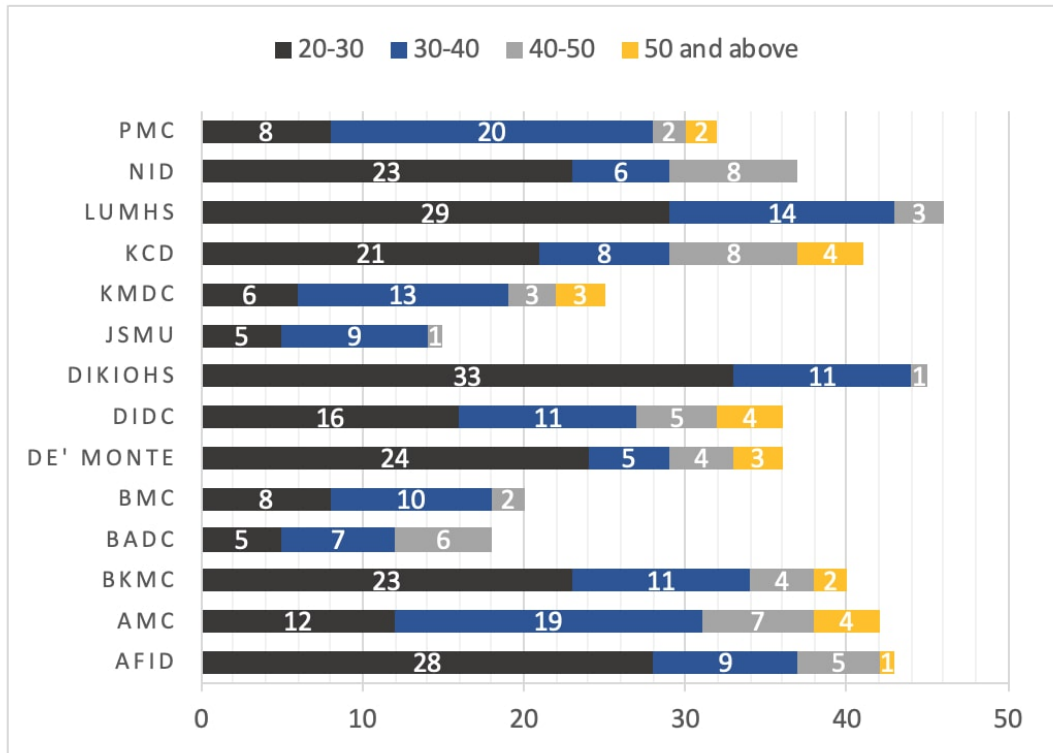


Figure 2. Percentages of the dentists and the subjects which were not taught in their dental schools. (x= percentage, y= subjects)

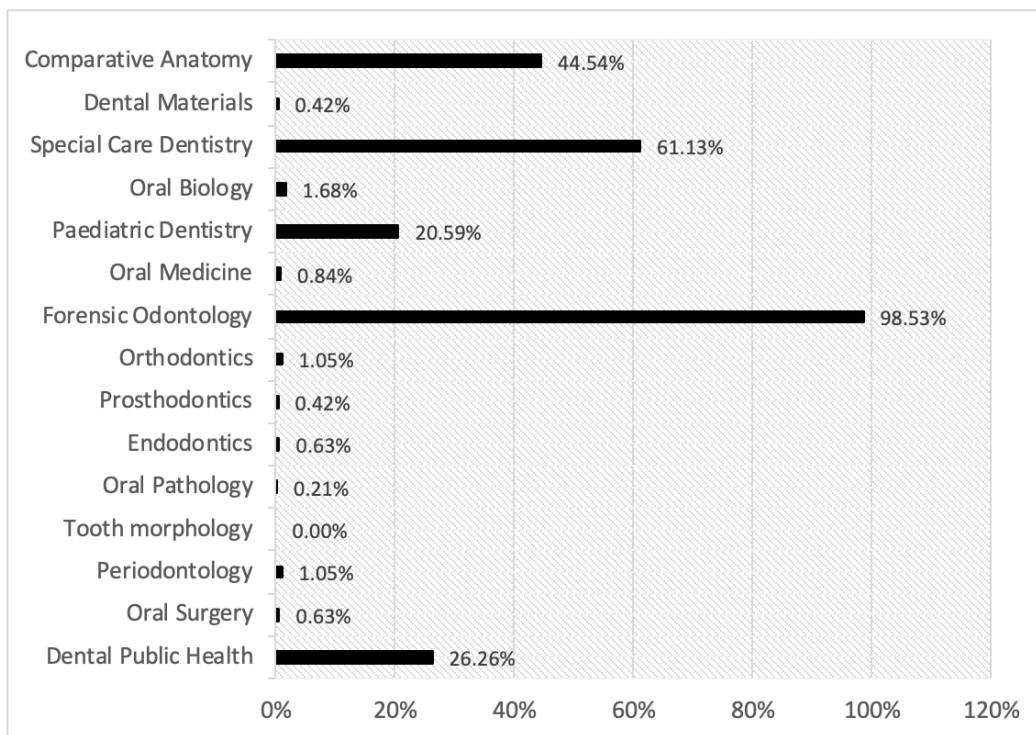


Figure 3. Various sources used for awareness of FO in contrast to the age groups of dentists. (x= count of dentists, y= sources)

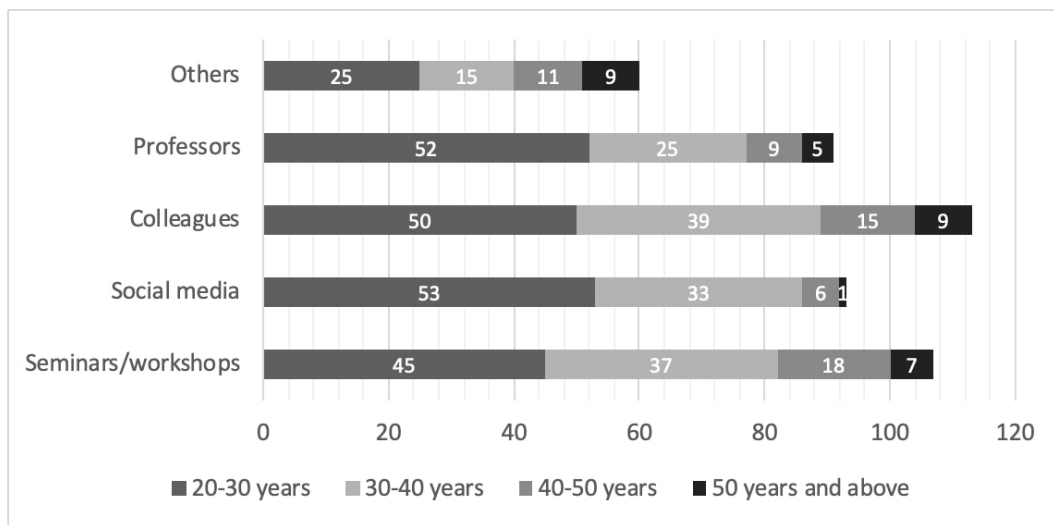


Figure 4 demonstrates Q3, which was a multiple-choice question, the author received 849 responses from 334 dentists. When analysed per participant, 62% of the dental professionals made entirely correct choices whereas, the rest of the 38% either chose completely non-FO or had a mixture of various FO and non-FO options. But the

only 5 sub-topics of FO which were correct, were selected all together by 9 (2.6%) dentists only. Figure 5 also exhibits other combinations chosen by the dentists. This reflects that a very small number of dental professionals had a complete understanding of the scope of FO at all and the majority was only informed.

Figure 4. Percentages of the dentists who made choices for the sub-topics of FO according to their knowledge. (x= percentage of dentists, y= choices given as sub-topics)

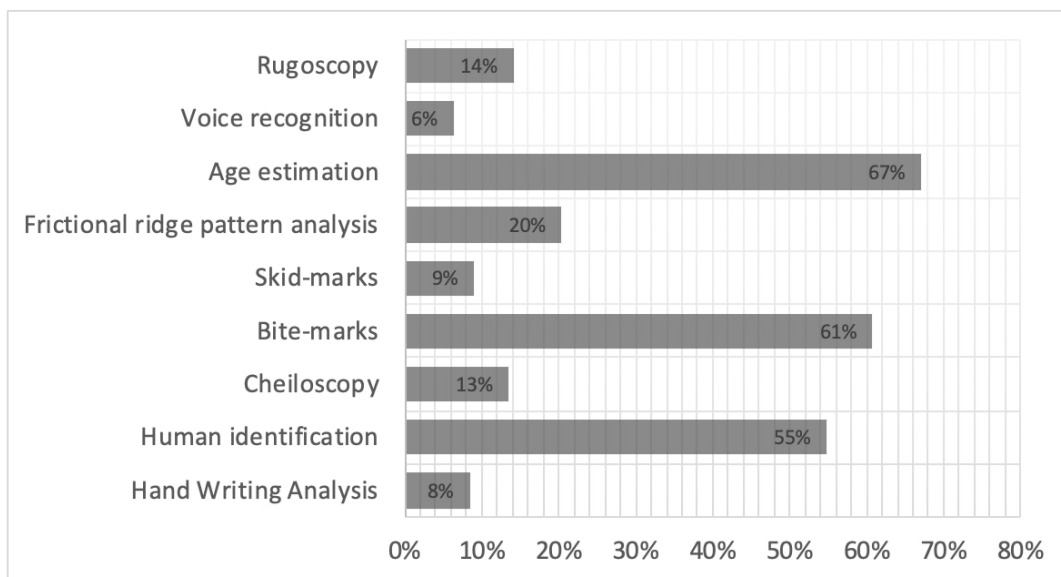
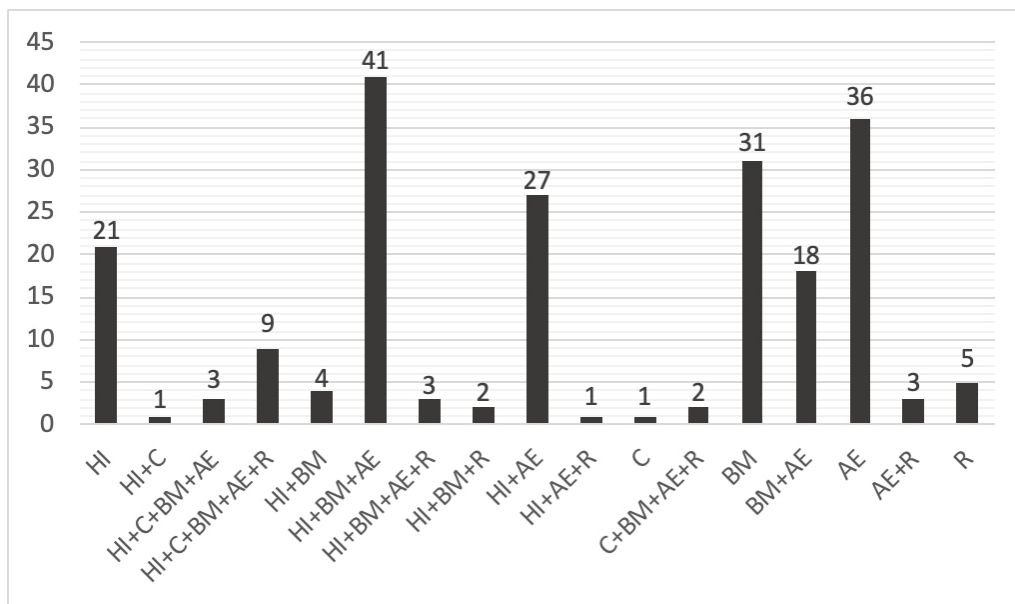


Figure 5. Count of dentists who solely chose FO related sub-topics (single or combinations). HI= human identification, C= cheiloscopy, BM= bite mark analysis, R= rugoscopy, AE= age estimation.



When assessment about information of FO was based on age and experience of the dentists, it was found as illustrated in Figure 6 and 7 that even though sample was not equally divided according to age and experience ranges, yet, it is observed that the higher the age range and greater the experience the poorer the results of the question.

When questioned, if they were professionally trained in FO only 4 dentists (1%) replied 'YES'.

Of these 4 dentists, 3 described the details of the professional training as: thesis in FO, attended a workshop of FO and been a member of the Forensic team in Havelian plane crash in Pakistan. Only 48 (10.08%) dentists of this study have worked in the field of FO. The work being "given opinion in a case related to forensics" (n=37), "assisted a forensic odontologist" (n=5) and "worked as a Forensic Odontologist" (n=1) followed by blank (n=5).

Figure 6. Count of responses from dentists of various age groups showing total responses to this question about sub-topics of FO and the incorrect selections made by specific age groups. (x= age groups, y= count of responses)

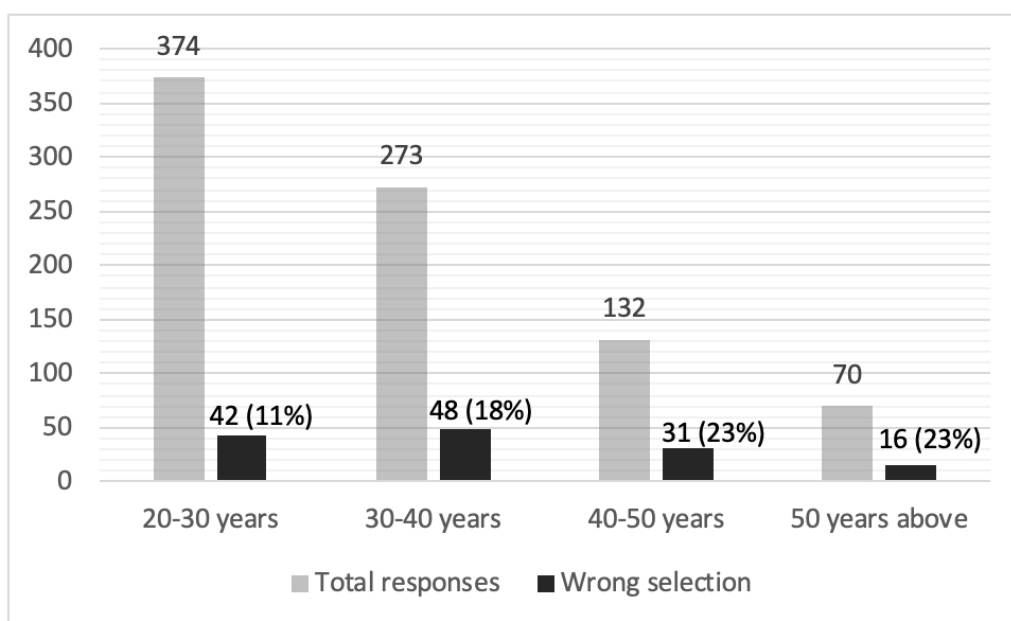
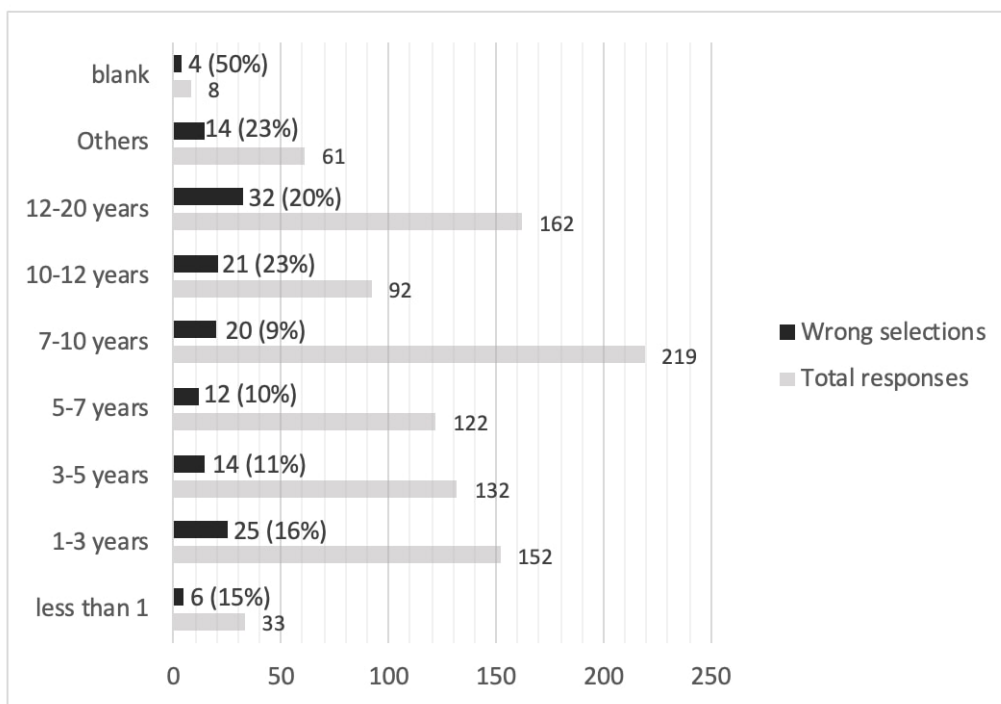


Figure 7. Count of responses about sub-topics of FO based on the work experiences in contrast to total responses and the incorrect selections made by specific groups of work experiences. (x= count of responses, y= work experience in years, Other= experience of more than 20 years)



Considering dental charts, 290 dentists (61%) claimed they do not make a detailed dental chart of every patient. and 261 (55%) stated they or the hospital maintained the dental records. As illustrated in figure 8, most of the dentists (n=69) maintain the data for “more than 5 years” followed by “6 months” (n=54). Out of the 261 dentists who claimed to maintain records,

149 claimed they keep the record manually, whereas 86 dentists store it digitally and only 16 selected the option “BOTH”. Some dentists opted “YES” for Q7 but did not fill the part querying the methods (n=10) and duration (n=9) of data storage. Figure 9 shows variations in Q7 from the dentists of the same institute at the same time.

Figure 8. Duration and methods reported by the dentists for maintaining the dental records. (x= count of dentists, y= duration of record maintenance).

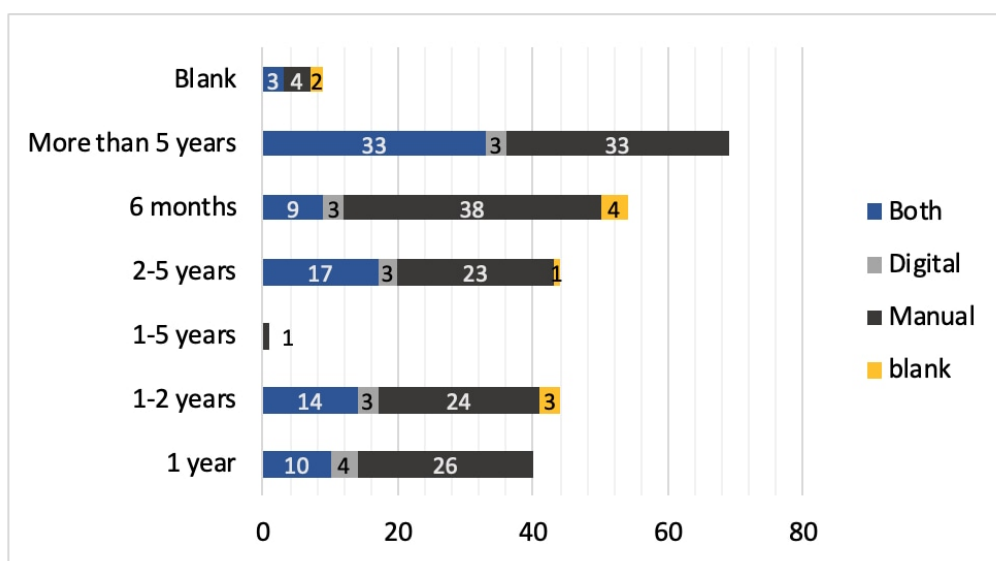
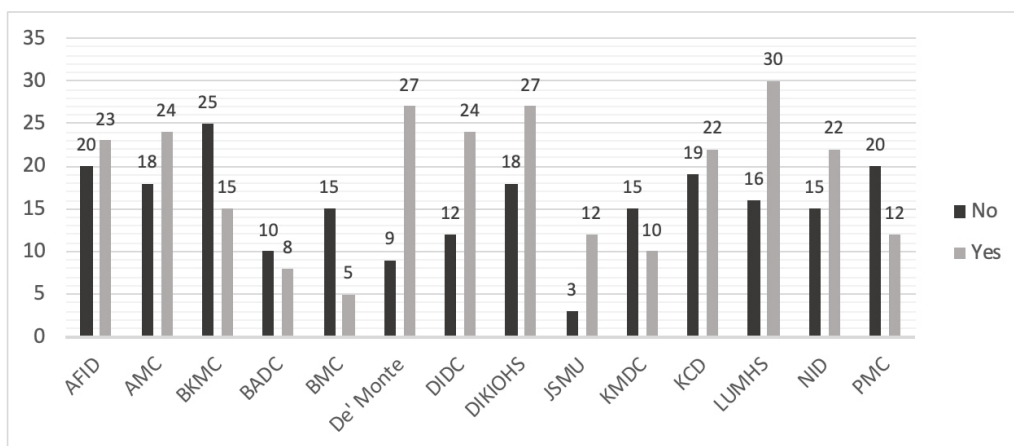


Figure 9. Variations in the answers of dentists from same institutions: if they or the hospital maintain dental records. (x= institutes, y= count of dentists)

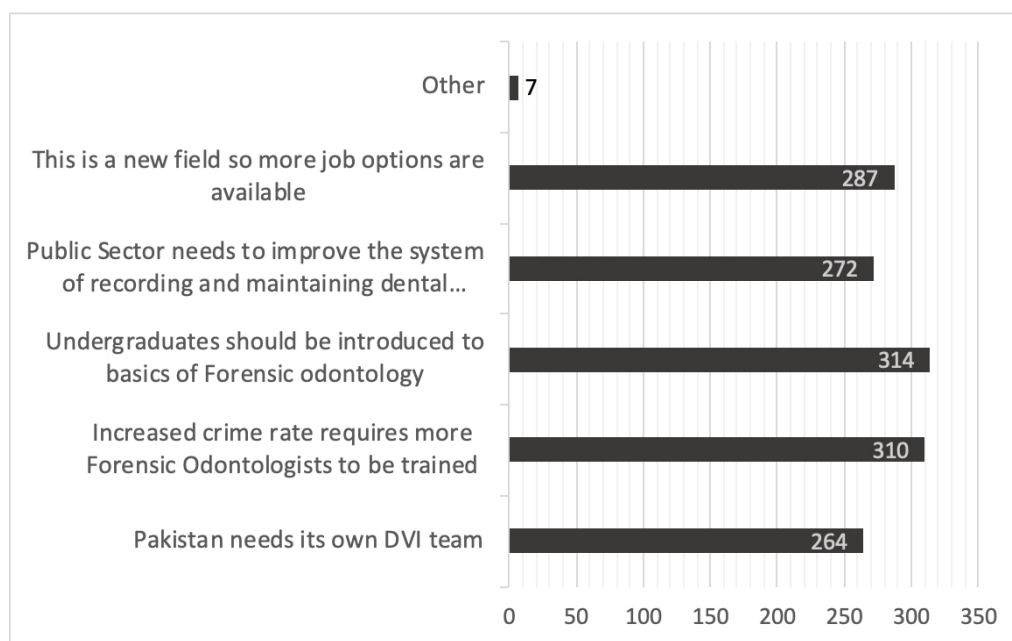


The dentists could choose multiple options for Q8 and the number of responses was 577. Most of the responses (n=193) considered “Radiographs” as the most stored type of dental record followed by “dental charts” (=150), “dental casts” (n=130) and “photographs” (n=104). As Q9 was also a multiple-choice question, hence the total number of responses was 1,454. Figure 10 shows the reasons selected by the participants for the need of FO. Seven dentists who selected the

option “OTHER” had some open answers such as: governmental support for FO in dental institutions, to meet global standards, the addition of FO to the undergraduate curriculum and postgraduate programmes/ workshops should be introduced in this field.

Finally, about the interest of the dentists to be trained in FO within Pakistan, 423 (89%) determined “YES” opposing to this only 53 (11%) of the dentists chose “NO”.

Figure 10. Different reasons selected by the dentists as need for application of FO in Pakistan (x= count of responses, y= reasons for the need of FO).



DISCUSSION

Age estimation and Human identification in Pakistan

In the past, there was an absence of official documents for many Pakistani residents which proved age and in addition, over time, this lack of documentation has grown given an increase in the number of refugees (4, 5). Also, child marriage is practised all over Pakistan as a culture and tradition. Pakistan has a high level of seismic activity and is therefore prone to natural disasters. It also suffers from man-made disasters along with various crimes such as rape, child abuse, beheading and arson (6, 7). At present, economic conditions in the country make the use of methodologies such as DNA and fingerprinting expensive and complex. Therefore, comparative dental analysis is a cost-effective and easy method in such circumstances.

Education in FO

Although similar national studies have been conducted, they focused upon smaller samples from a specific city or a specific institute only (8, 9). In this comprehensive study, 98.5% of the participants confirmed that they were not taught FO, even though, according to the Pakistan Medical and Dental Council (PMDC), 5 hours of Law and Dental Forensics have to be taught under the subject of Oral and Maxillofacial Surgery (2). This could be due to the lack of qualified instructors or negligent behaviour of the staff towards designing a course line for this subject. 66% of those sampled had at least heard about FO and were aware of it via social circles, globalization of media, seminars/workshops, visiting international FO faculty and through books/literature. Another reason may also be the cases from Pakistan in which FO has been used (Gen. Zia, Junaid Jamshed and Shahrukh Jatoi).

Awareness of FO

As defined by the Oxford Dictionary of English, *information* is "facts provided about something or someone" and *knowledge* is "facts, information and skills acquired through experience or education" (10). Knowledge requires cognitive and analytical ability, while to be informed does not require any such ability. The dentists understood the basic information about FO and they correctly selected: age estimation (67%), bite marks (61%) and human identification (55%); however, answers such as frictional ridge pattern

analysis (20%), skid marks (9%), handwriting analysis (8%) and voice recognition (6%) were incorrectly classified as sub-topics of FO. 208 responses out of 334 were entirely correct but only 2.6% selected all 5 correct options combined. The above findings show that even if the majority of the participants had satisfactory awareness about FO, many of them still did not have a basic understanding about the vast usage of FO, and due to this poor information, they ended up speculating the sub-topics of FO or chose the incorrect options.

Furthermore, the poor information regarding Rugoscopy and Cheiloscopy could be due to a lack of awareness and insufficient knowledge about the aspects and use of these techniques in Pakistan. Since 2004 only thirty scientific papers about FO have been published in Pakistan and the publishing rate has been irregular since early 2000. Most of the scientific papers are published after the year 2012 which reflects recent growth of FO in the country.

Although the government hospitals in Pakistan received a good number of medico-legal cases on a daily basis, 99% of the total sample did not include any trained forensic odontologist assigned to the institutes/hospitals. These results are consistent with the results of the previous studies that claimed a lack of formal training in Pakistan (8, 11). The author suggests that advertising and awareness programmes would improve the level of awareness of FO in different parts of the world, where it may be a need but is only given consideration after the occurrence of some major incident or a disaster.

Dental records

More than half of the respondents (61%) stated that they do not make a detailed dental chart of every patient which reflects that they are not fully aware of the importance of dental charts for forensic purposes.

A lack of technological skills, computers and software, combined with a shortage of electric power especially in the peripheral areas, limited data of the patients, shortage of trained personnel and lack of space to store manual records may be the reasons why the dentists in this survey do not store the data. And if they do, they do so manually and only for shorter periods. The PMDC only mentions briefly the maintenance of medical and dental records in Section 42 of the code of ethics of practice for

Medical and Dental practitioners 2018. It is vaguely explained in clause 3.3 of Section 4 of PMDC Professional ethics and code of conduct, Annexure H (2). Neither the Ministry of Health Services and Coordination (NHSRC) nor the PMDC provides details about guidelines regarding proper dental data recording and storage (2). Also, neither of these professional bodies advise mandatory use of dental charts as part of dental data recording in Pakistan. The introduction of legislation for mandatory dental data recording would help in numerous medico-legal cases. This would also prove beneficial for the practitioners themselves if ever involved in a case related to malpractice or dental fraud.

Radiographs were the most commonly saved records and only a minority of dentists claimed to save all main types of dental records together (charts, casts, radiographs and photographs). Extra measures should be taken to make sure good quality dental charting is obligatory in all dental practices of Pakistan and the personnel should be properly trained in transcribing and understanding dental charts even in busy schedules. Clinical audits should be undertaken in the dental practices and the government sector needs to improve data management systems.

Interest in FO

89% of the total respondents supported the introduction of training in FO within Pakistan. Universities should introduce a postgraduate

course in this field. Pakistan lags behind many countries who have their own departments and societies for FO and teams for DVI comprising Forensic Odontologists. Although Pakistan has been a member of Interpol DVI since 13th June 1956 no advancements have been noticed and the country's National Disaster Management Authority has no mention about the importance of the role of a forensic odontologist in a disaster on its official webpage (12). Perhaps, associations or societies for FO in Pakistan should also be created, similar to other countries, specifically Asian ones, which would aid collaboration with other international FO organizations and provide an impetus for this field within the country.

CONCLUSIONS

The majority of the dental practitioners in this study was aware of the existence of FO but they need to acknowledge the significance of dental record keeping and encourage the implementation of FO. Regardless of the absence of any governing body for FO and negligible education, training and implementation in Pakistan, this field is gradually progressing. However, the authorities should introduce detailed guidelines for dental records, ensure the future development of this subject in the education system and assign forensic odontologists to the DVI teams. At last, these initial steps can secure a better future for FO in Pakistan.

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