

AWARENESS ON FORENSIC ODONTOLOGY AMONG DENTAL UNDERGRADUATES

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ABSTRACT

Forensic odontology deals with legal investigations in which it primarily involves the identification of the offender by comparing dental records to a bite mark left on the victim. It is especially used for the application of the principal of law and criminal investigation. Aim of the study is to evaluate knowledge and awareness on forensic dentistry. This special brand deals with the dental evidence obtained from the victim. As the field of forensic dentistry focuses on the methods of detection, collection and analysis of bite mark remains is very helpful in crime investigations to analyse the acquired evidence. In the past decades oral pathologists had major responsibilities in developing forensic science. A cross sectional study on undergraduates was carried out using a questionnaire with close ended questions. The survey had 15 questionnaires circulated in Google forms and 100 responses were obtained from the population, representation of data was in pie chart and bar graphs. Majority of the study population answered yes as they feel forensic odontology is very much essential to deal with crime investigation. 62.7% of the study population responded positively where they are able to differentiate the work of forensic anthropologists and a forensic odontologist first. The students' knowledge on forensic odontology and what it deals with, was significant with the year of study where final year students are more aware about forensic odontology. P value = 0.00(<0.05) which is statistically significant. This study concludes that most of the participants have knowledge and awareness on the role of forensic dentistry among dental undergraduates.

Keywords: Attitude, awareness, forensic odontology, Knowledge, Practice.

INTRODUCTION

Forensic odontology deals with legal investigations in which it primarily involves the identification of the offender by comparing dental records to a bite mark left on the victim. ('Introduction to Forensic Odontology', 2011)(Downs, Upshaw Downs and Barsley, 2018)(Jain, 2012)(Masthan, 2009) It is especially used for the application of the principal of law and criminal investigation.(James and Higgins, 2016)(Tren Grove, 2016)(Bush and Delattre, 2013)(Pandey and Hemanth, 2013) This special brand deals with the dental evidence obtained from the victim. As the field of forensic dentistry focuses on the methods of detection, collection and analysis of bite mark remains is very helpful in crime investigations to analyse the acquired evidence (Tripathi, 2016)(Carabott, 2013)(Namene and Doggalli, 2018)(Pretty,

2003)(Pretty and Sweet, 2001b)(Pretty and Sweet, 2001a)(Pretty and Turnbull, 2001) In the past decades oral pathologists had major responsibilities in developing forensic science. The pathologists were not about handling forensic cases due to inadequate training in this field and in adequate exposure of the subject was also one of the reasons for this issue (Shetty and Raviprakash, 2011)(Kavitha, 2013)(Vannalaet *al.*, 2017)(Venkatachalapathy, 2012) Poor attitude and lack of practice of forensic odontology and inadequate knowledge was one of the major reasons. This branch remains quite challenging and fascinating which involves the practitioner to identify the deceased individual though antemortem amid postmortem report(Preethi, Einstein and Sivapathasundharam, 2011)(Sheddi, Al Sheddi and Al Asiri, 2015) The dental identification provides an accurate sense of identification of the victim of the suspect.(David and Lewis, 2018)(Adams, Carabott and Evans, 2013) Not many institutions offer the formal training of forensic odontology. They do lack job opportunities(Preethi, Einstein and Sivapathasundharam, 2011) The numbers of cases reported in the date 1960s has been expanded to such are extent where the term became familiar among almost all the dentists around the world.(Gambhiret *al.*, 2016)Lip prints and rugoscopy study of palatal , sugar patters and even it include sialo- chemistry i.e detection of chemicals in saliva(5) Age remains one of the etiological factors in establishing the identity of the person. There is small variation in tooth formation and eruption process among people. This helps to determine the chronological age of primary method of a person primary method used(Gambhiret *al.*, 2016)(Al-Azri, Harford and James, 2016) The success of identification depends largely on the accuracy and adequacy of data it relief on when legible tooth coding was reported at high level(Al-Azri, Harford and James, 2016) Aron Classified forensic odontology into civil, criminal and research. FDI also has a concern on dealing the criminal cases with full effort. FDI also stated that evaluation and preservation of dental findings is very important (Venkateshet *al.*, 2016) Communication, training and evidence based guidelines are important in collecting dental samples from crime scenes(Gambhiret *al.*, 2016) A tooth has the capacity to endure decomposition and it can tolerate intense change in temperature. This makes the dental validation assessment and evaluation most reliable and assistant (9) Indian Dental Association recommends that an individual dental records should be securely retained for at least the legal minimum of 5 to 6 years(Kumar *et al.*, 2014) So, in the world wide scenario, forensic odontologists play an important role in human identification, bite mark analysis and malpractices that are taking place. Determination of species, determination of gender and rare and DNA analysis and to identify the social reconstruction and facial suspect imposition.(Rahmanet *al.*, 2017)(Kumar *et al.*, 2014) Combined width of six maxillary anterior teeth has been used for estimation of age in forensic Odontology. Forensic odontology has been designated as a crucial part of forensic medicine. The study of the periodontal structures post mortem can help in identification, determination of time of death, sex determination and age estimation of the deceased. Cheiloscopy is a forensic investigation technique that deals with identification of humans based on lipstraces. While forensic dentistry is a specialized field, oral health professionals play an important role by maintaining accurate dental records that may be used for identification in future cases

MATERIALS AND METHODS

Study design:

A cross sectional study was conducted from April to May 2020 through an online survey among Undergraduate dental college students of private dental institutions.

Study subjects:

A blind cross sectional study using a questionnaire with close ended questions was carried out. Undergraduates were included to assess their knowledge and practice in this study. In addition to undergraduates interns also took part in the study as this was completely based on Age group based. The questions were circulated in Google forms and 100 responses were obtained from the population. The survey had 15 questionnaires in its method representation of data as pie chart and bar graph tables.

Inclusion criteria: All undergraduate dental college students of private dental institutions who were willing to participate were included.

Exclusion criteria: Undergraduate dental college students of private dental institutions who were not willing to participate were excluded.

Ethical considerations:

Returning the filled questionnaire was considered as implicit consent with no need for signing a written consent. Ethical approval for the study is obtained from the Institutional Review Board (IRB) .

Study methods:

Self administered questionnaire of 14 close ended questions was prepared and it was distributed among undergraduate dental college students of private dental institutions through online survey forms "GOOGLE FORMS". Demographic details were also included in the questionnaire.

Data quality assurance:

The collected data were checked regularly for clarity, competence, consistency, accuracy and validity. The necessary correction was made on questionnaires that need correction accordingly and invalid questionnaires were removed before the actual data collection.

Statistical analysis:

Data was analysed with SPSS version (22.0). Descriptive statistics as number and percent were calculated to summarise qualitative data. Chi square test was used to analyze and compare the education level of students and their knowledge on forensic odontology . The confidence level was 95% and of statistical significance $P < 0.05$. Finally, the result was presented by using bar charts and frequency tables. (Duraisamy *et al.*, 2019)(Ganapathy, 2016)(Jain, Ranganathan and Ganapathy, 2017)(Ashok and Suvitha, 2016)(Ajay *et al.*, 2017)

RESULTS AND DISCUSSION

82.4 % of the study population felt Forensic dentistry is reliable whereas 17.6% of them felt it is not reliable [Figure 1]. 62.7% of the respondents felt that forensic anthropologists and a forensic odontologist are able to determine how old someone is [Figure 2]. 64.7% of the study population felt that forensic experts are able to determine the gender of an unidentified individual whereas the remaining group of population disagreed with the statement [Figure 3]. 58.8% of the respondents believed that fully formed teeth would be the good source of DNA whereas 41.2% respondents felt that fully formed teeth would not be the good source to obtain DNA molecules [Figure 4]. 63.7% of the dental students believed that a licensed dentist could act as forensic dentist whereas the remaining set of population could differentiate the role of licensed and forensic dentist in dentistry [Figure 5]. 58.8% of the study population felt malpractices can be proven by a forensic dentist whereas 41.2% of the dental students disagreed with the statement [Figure 6]. 64.7% of the dental students felt Bite mark analysis must be photographed within 10 days, 25.5% of the study population felt that bite mark analysis must be photographed in 9 days , 5.9% of the study population felt bite marks in human tissue should be photographed in 11 days [Figure 7]. 74.5% of the dental students thought tissue would swell in 7 days if it was not photographed on time [Figure 8]. 43.1% of the respondents felt forensic dentistry is not responsible for assessment of the bite mark injuries, 34.3% of the respondents felt forensic dentistry is not responsible for identification of found human remains, 13.7% of the dental students felt forensic dentistry has no role in determining the amount and type of DNA, 8.8% of the respondents felt forensic dentistry has no role in age estimation [Figure 9] 78.4% of the respondents believed that extraction of DNA from pulp of tooth and extraction of DNA from ground up teeth is used for victim identification [Figure 10]. 62.7% of the respondents felt antemortem and postmortem are different terminologies whereas 37.3% of the respondents felt both were almost same terminologies [Figure 11]. 51% of the respondents believed forensic experts would easily distinguish siblings and identical twins with the help of DNA traces whereas the remaining 49% of the study population disagreed with the statement [Figure 12]. 60.8% of the dental students thought that forensic odontologists compare both the antemortem and postmortem reports while dealing with criminal cases whereas the remaining 39.2% of the respondents disagreed with the statement [Figure 13]. 68.8% of the study population felt that forensic experts would raise different type of questions to investigate whereas 31.4% of the respondents felt that the investigation focuses on one type of question. 68.6% of the study

population felt forensic odontology mainly focuses on Teeth remains, 12.7% of the respondents felt forensic odontology concentrates on feet, 11.8% of the respondents felt forensic odontology concentrates on Torso part of the body, 6.9% of the remaining population felt forensic dentistry concentrates on skull [Figure 14].

Forensic odontology is an important branch of dentistry study which would help resolve abuse and death cases. In the growing field of medicine, greater knowledge and understanding among dental practitioners about forensic odontology will be needed. In a number of developed countries around the world, the practice of forensic odontology has taken on importance. But it has yet to gain full momentum in developing countries like India ('Updated Locator of Treatment Programs Available Online', 2005) In the present study the association between the knowledge on determining the age of an individual by a forensic expert and the year of study of the dental students. Majority of the fourth year undergraduate dental students were much aware. Pearson chi square test-2.757, P value - 0.599 (>0.05) which was statistically not significant. In the present study the association between the knowledge on license dentists acting as a forensic dentist and the year of study of the dental students. Third year undergraduate students had better knowledge compared to the other years. Pearson chi square test-5.9777, P value - 0.201(>0.05) which was statistically not significant. In the present study the association between the knowledge on comparison of postmodern and antemortem records by forensic experts and the year of study of the dental students. Among all the years, third year undergraduate students had better knowledge. Pearson chi square test-6.142, P value - 0.189(>0.05) which was statistically not significant. In the present study the association between the knowledge on forensic odontology concentrating on body parts and the year of study of the dental students. Fourth year undergraduate students had better knowledge. Pearson chi square test-42.552, P value - 0.00 (<0.05) which was statistically significant. In the present study the association between the knowledge on antemortem and post-mortem and the year of study of the dental students. Among all the years, third year undergraduate students had better knowledge. Pearson chi square test-6.142, P value - 0.189 (>0.05) which was statistically not significant.

Knowledge on the progress of applications and guidelines on forensic dentistry at UG level, can be done through seminars and also through the organization of seminars and conferences. Similar surveys and research must be conducted at different levels to spread the awareness globally so that everyone can gain the benefits in the near future. The limitation of this study was biased sampling, equal number of participants can be included from different years of study to get more accuracy in the results. The future scope of this study is that it can be expanded widely to include an equal number of participants to assess the awareness and knowledge on forensic odontology among dental students.

The present research has origins from previous studies where the investigations involved in studies which were done based on clinical reports interventional studies (Arigaet *et al.*, 2018)(Ashok *et al.*, 2014; Jyothiet *et al.*, 2017)(Venugopalan *et al.*, 2014), in vitro studies (Duraisamy *et al.*, 2019)(Ganapathy, 2016)(Jain, Ranganathan and Ganapathy, 2017)(Ajay *et al.*, 2017) and systematic reviews (Arigaet *et al.*, 2018)(Selvan and Ganapathy, 2016)(Subasree, Murthykumar and Dhanraj, 2016)(Vijayalakshmi and Ganapathy, 2016)(Ganapathy, Kannan and Venugopalan, 2017)(Kannan and Venugopalan, 2018)(Basha, Ganapathy and Venugopalan, 2018)

FUTURE SCOPE:

Study can be expanded to more number of participants. Should create more awareness and provide knowledge about the study. Study also can be done with other department students as well including post graduates and fellowship students.

CONCLUSION:

This study concludes that most of the participants have knowledge and awareness on the role of forensic dentistry among dental undergraduates. The appreciable knowledge among dental students at undergraduate level is due to structured and formal training, students are provided with detailed study materials, and inclusion of forensic odontology as a part of dental curriculum.

AUTHOR CONTRIBUTIONS:

Author 1 (Bipin M), carried out the study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Dr. L. KeerthiSasanka) aided in conception of the topic, has participated in the study design, statistical analysis and has supervised in preparation of the manuscript. Author 3 (Dr. Kavitha. S) has participated in the study design and has coordinated in developing the manuscript. All the authors have discussed the results among themselves and contributed to the final manuscript

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CONFLICTS OF INTEREST:

Declared as none

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Table 1: Awareness on forensic odontology among dental undergraduates

| S.No | Questionnaire | Choices | Responses |
|------|---------------|---------|-----------|
|------|---------------|---------|-----------|

| | | | |
|-----|---|---|---------------------------------|
| 1. | Are Forensics reliable? | Yes No | 82.4% 17.6% |
| 2. | Can a forensic anthropologist and a forensic odontologist tell you exactly how old someone is? | Yes No | 62.7% 37.3% |
| 3. | Can Forensic expert able to determine the gender of an unidentified individual? | Yes No | 64.7% 35.3% |
| 4. | Is the fully formed tooth a good source of DNA? | Yes No | 58.8% 41.2% |
| 5. | Can a licensed dentist act as a forensic dentist? | Yes No | 63.7% 36.3% |
| 6. | In a dental malpractice case, negative by the dentist or injury to the patient has to be proven , but not both | True False | 58.8% 41.2% |
| 7. | Bite mark in human tissue must be photographed before how many days? | 7 days 9 days 10 days 11 days | 3.7% 25.5% 64.7% 5.9% |
| 8. | Will the tissue begin to swell after 7 days if its not photographed on time? | Yes No | 74.5% 25.5% |
| 9. | Forensic dentistry is responsible for all following except | -determining the amount and type of DNA -identification of found human remains -Assessment of bite mark injuries -Age estimation | 13.7% 34.3% 43.1% 8.8% |
| 10. | Extraction of DNA from pulp of tooth and extraction of DNA from ground up teeth is used for victim identification | True False | 78.4% 21.6% |

| | | | |
|-----|--|---------------------------------|---------------------------------|
| 11. | Are the Antemortem and Postmortem are different terms used in forensic odontology? | Yes No | 62.7% 37.3% |
| 12. | Can forensic odontologists easily distinguish siblings and identical twins? | Yes No | 51% 49% |
| 13. | Do the forensic odontologists compare post mortem and antemortem records? | Yes No | 60.8% 39.2% |
| 14. | While investing a case ; Should we need to ask questions like who, what, where, when, why and How? | Yes No | 68.6% 31.4% |
| 15. | Forensic odontology concentrates on which body part? | Skull Torso Feet Teeth | 6.9% 11.8% 12.7% 68.6% |

GRAPHS

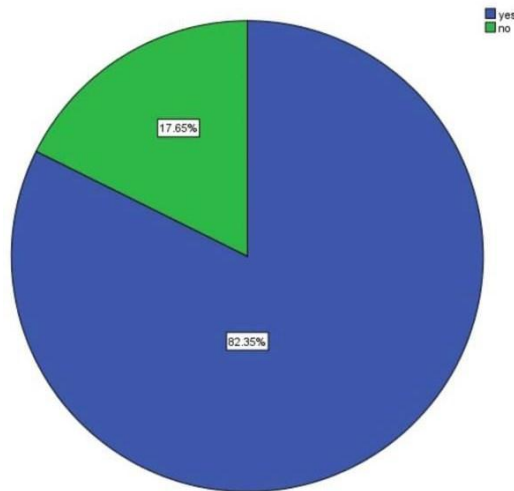


Figure 1: Pie chart representing the source of knowledge whether the forensic dentistry is reliable, where blue colour denotes Yes, Green colour denotes No. 82.4%(blue) of them had enough knowledge on forensic dentistry

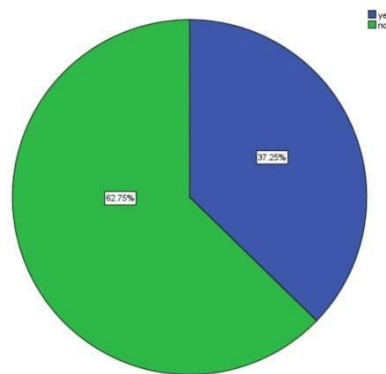


Figure 2: Pie chart representing the source of knowledge on the role of forensic anthropologist and forensic odontologist in forensic dentistry. Blue colour represents Yes, Green colour represents No. 62.7% (blue) respondents were aware.

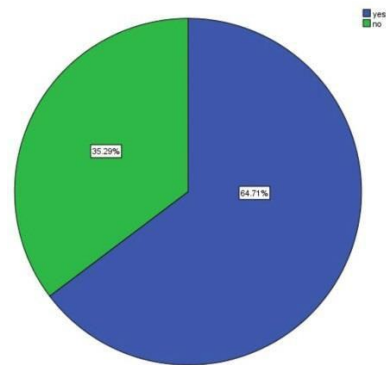


Figure 3: Pie chart representing the percentage distribution of knowledge on capability of determination of an unidentified individual by a forensic expert. Blue colour represents Yes, Green colour represents No. 64.7% (blue) respondents were aware.

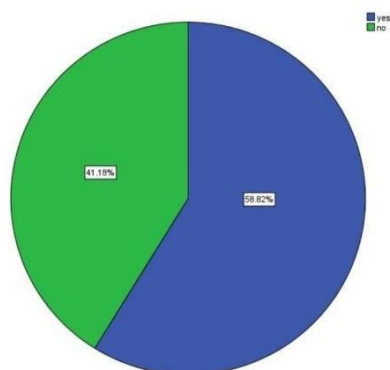


Figure 4: Pie chart representing the percentage distribution of knowledge on teeth as a good of DNA. Blue colour represents Yes, Green colour represents No. About 58.8% (blue) respondents were aware.

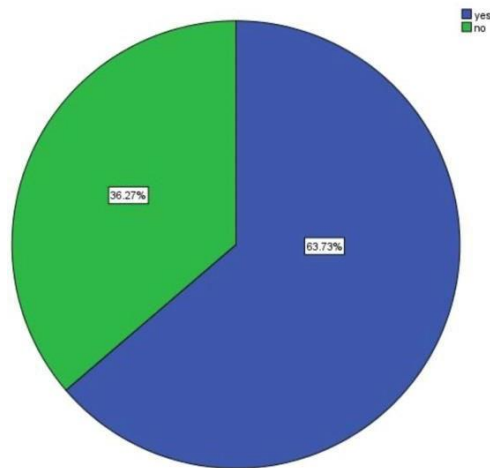


Figure 5: Pie chart representing the percentage distribution of knowledge on licensed dentists acting as a forensic dentist. Blue colour represents Yes, Green colour represents No. Majority of the participants (63.7%) of the respondents were aware.

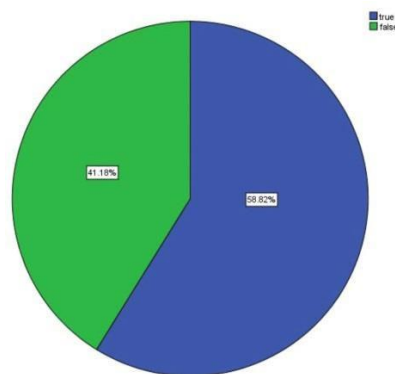


Figure 6: Pie chart representing the percentage distribution of knowledge on handling malpractice crime cases by forensic expert. Blue colour represents True, Green colour represents False. 58.8% (blue) of the respondents agreed to the statement.

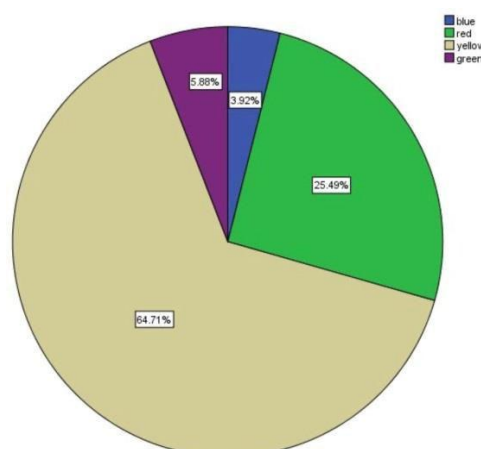


Figure 7: Pie chart representing the percentage distribution of knowledge on Time period requirement for bite mark analysis, where blue colour represents 7 days, Green colour represents 9 days, Sandal colour represents 10 days, Purple colour represents 11 days. 64.7% (Sandal) respondents were aware

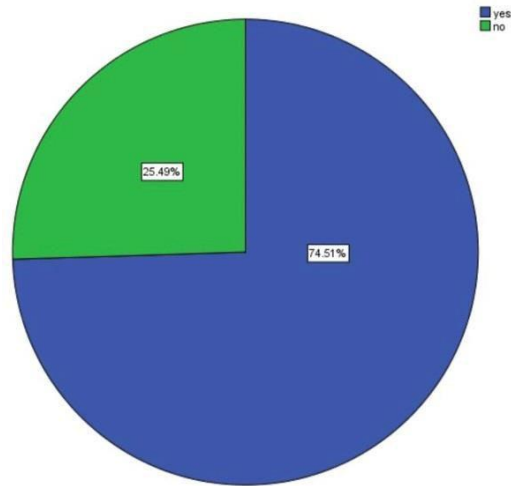


Figure 8: Pie chart representing the percentage of knowledge on tissue swelling after 7 days if it's not photographed. Blue colour represents Yes, Green colour represents No. 74.5% (blue) respondents were aware.

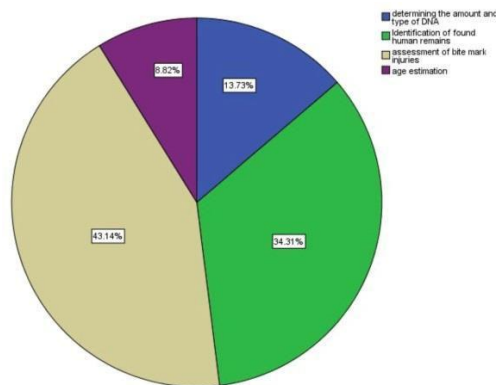


Figure 9: Pie chart representing the percentage of knowledge on importance of forensic Odontology. Blue represents determining the amount and type of DNA, Green colour represents identification of found human remains, Sandal colour represents Assessment of bite mark analysis, Purple colour represents age estimation. 43.1% (Sandal) of respondents were aware of the fact that forensic dentistry has a minimum role in determining bite mark injuries.

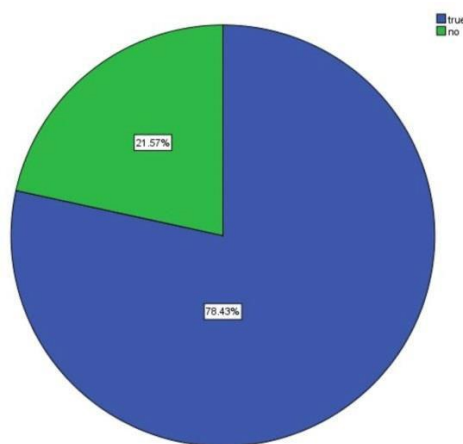


Figure 10: Pie chart representing the percentage distribution of knowledge on extraction of DNA from various parts of teeth helps in victim identification. Blue colour represents True and Green represents False. 78.4%(blue) respondents were aware.

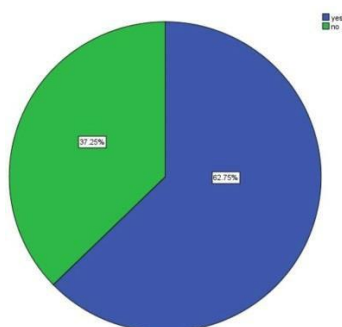


Figure 11: Pie chart representing the percentage distribution of knowledge on difference in Antemortem and Postmortem. Blue colour represents Yes, Green colour represents No. About 62.7%(blue) were aware of the statement.

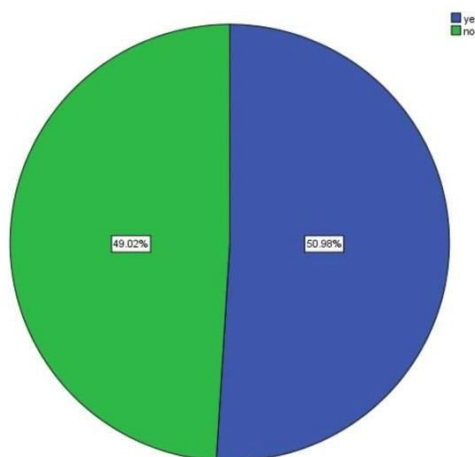


Figure 12: Pie chart representing the percentage distribution of knowledge on possibilities of distinguishing siblings and identical twins. Blue colour represents Yes, Green colour represents No. Majority of the participants (51%- blue) respondents were aware.

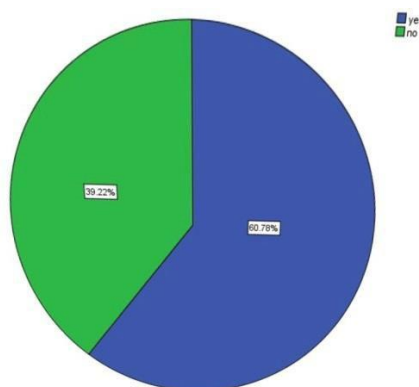


Figure 13: Pie chart representing the percentage distribution of knowledge on comparison of Antemortem and Post-mortem reports. Blue colour represents Yes, Green colour represents No. About 60.8%(blue) respondents were aware.

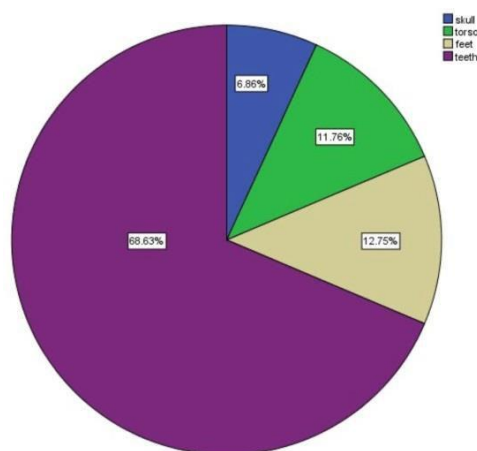


Figure 14: Pie chart representing the percentage distribution of knowledge on main focus on Odontology. Blue colour represents skull, Green colour Torso, Sandal colour represents Feet, Purple colour represents teeth. 68.6%(purple) respondents were aware of the fact that forensic Odontology concentrates on teeth

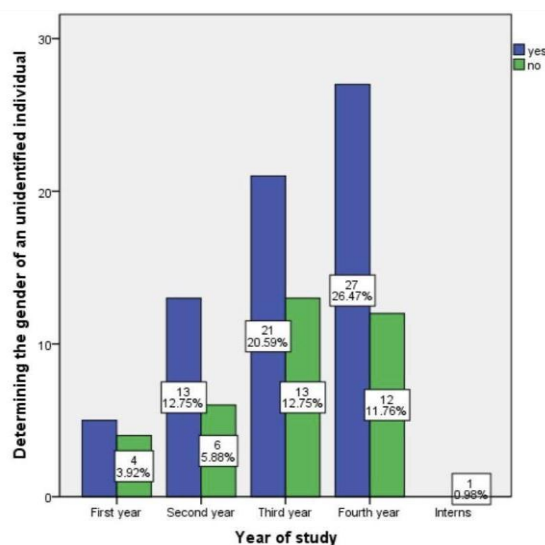


Figure 15: The bar graph represents the association between the knowledge on determining the age of an individual by a forensic expert and the year of study of the dental students. X axis represents the year of study and the Y axis represents the number of responses obtained for yes(blue) and no(green). Majority of the fourth year undergraduate students were much aware. Pearson chi square test: 2.757, df: 4 , p value - 0.599 (>0.05) which was statistically not significant. This proves, there is no evidence to suggest that there is an association between the year of study and the knowledge on determining the age of an individual by a forensic expert.

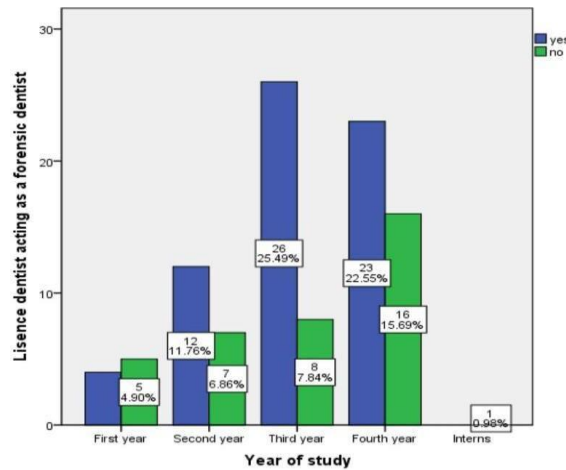


Figure 16: The bar graph represents the association between the knowledge on license dentists acting as a forensic dentist and the year of study of the dental students. X axis represents the year of study and the Y axis represents the number of responses obtained for yes(blue) and no(green). Majority of the Third year undergraduate students had better knowledge compared to the other years. Pearson chi square test-5.9777,df:4; p value - 0.201(>0.05) which was statistically not significant. This proves, there is no evidence to suggest that there is an association between the year of study of the participants and the knowledge on determining the role of license dentist and forensic dentist.

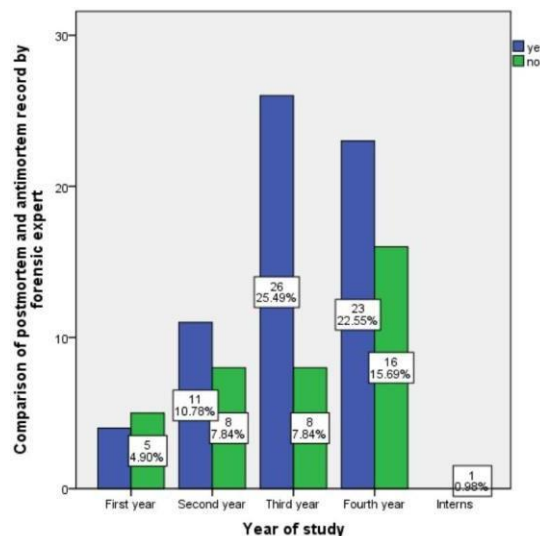


Figure 17: The bar graph represents the association between the knowledge on comparison of postmodern and antemortem records by forensic experts and the year of study of the dental students. X axis represents the year of study and the Y axis represents the number of responses obtained for yes(blue) and no(green). Among all the years, third year undergraduate students had better knowledge. Pearson chi square test-6.142, df:4; p value - 0.189(>0.05) which was statistically not significant. This proves, there is no evidence to suggest that there is an association between the year of study of the participants and the knowledge on comparison of postmortem and antemortem records by forensic experts.

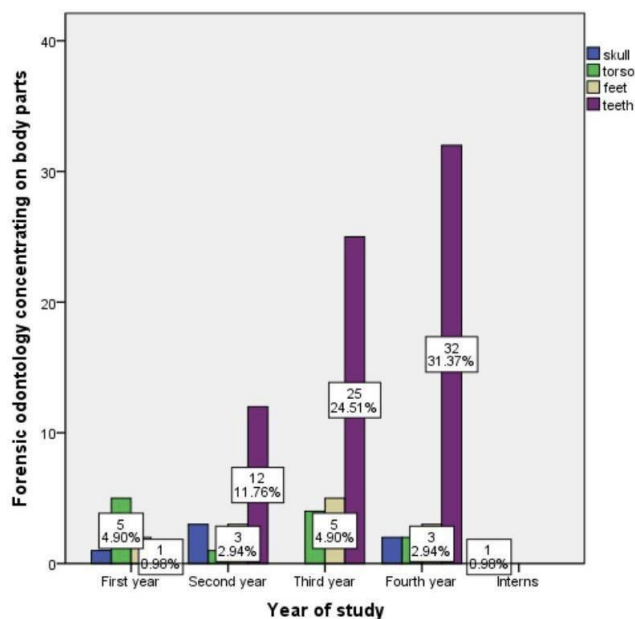


Figure 18: The bar graph represents the association between the knowledge on forensic odontology concentrating on body parts and the year of study of the dental students. X axis represents the year of study and the Y axis represents the number of responses obtained for yes(blue) and no(green). Fourth year undergraduate students had better knowledge. Pearson chi square test- 42.552, df:12; p value - 0.00 (<0.05) which was statistically significant. This shows suggestive evidence that there is an association between years of study of the participants and their knowledge on forensic odontology concentrating on body parts.

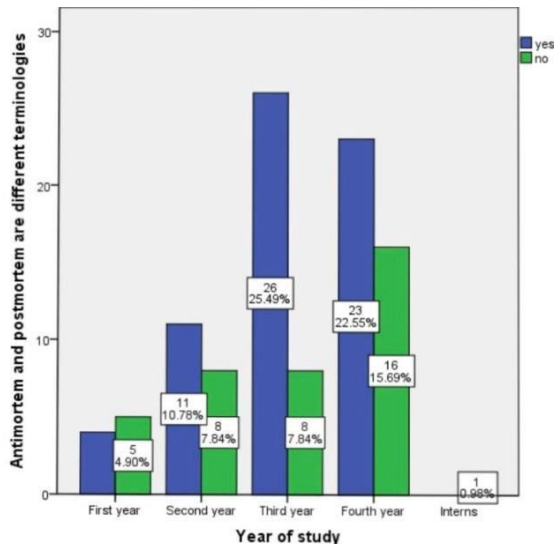


Figure 19: The bar graph represents the association between the knowledge on antemortem and postmortem and the year of study of the dental students. X axis represents the year of study and the Y axis represents the number of responses obtained for yes(blue) and no(green). Among all the years third year undergraduate students had better knowledge. Pearson chi square test- 6.142, df :4; p value - 0.189 (>0.05) which was statistically not significant. This proves, there is no evidence to suggest that there is an association between the year of study of the participants and the knowledge on antemortem and postmortem records.

