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Knowledge On Pulpal Defects Among The Ug Dental Students - A Cross Sectional Survey

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ABSTRACT:

Background: The pulp is a mass of connective tissue that resides within the center of the tooth, directly beneath the layer of dentin. It is referred to as part of the "dentin-pulp" complex, and also known as the endodontium, these two tissues are closely interrelated and dependent on each other's development and survival. Pulpal defects include pulp stones and pulp death which eventually deteriorates the oral health.

Aim: To evaluate the knowledge of pulpal defects of teeth among undergraduates.

Materials and methods: This is a questionnaire based cross-sectional study performed among 100 dental UG students in a private dental college. Random sampling is used to minimise the sampling bias.A questionnaire of 10 questions about Pulpal defects were circulated through the online service Mode among undergraduates. The data was collected and analysed using SPSS software version 23. Chi square test was used to analyze and comparative bar graphs were plotted and it is statistically significant only if the p value is less than 0.05. Pearson chi square test P value is 0.016 which is statistically significant.

Result: There were 100 responses collected from dental UG students for this survey. From the responses collected,it is shown that the second year students (48%) were more knowledgeable about Pulpal defects than first year(23%) and third year (29%).The

association between year of study and number of respondents who were aware of Pulpal defects is evaluated by Pearson chi square test P value is 0.016 which is statistically significant.
Conclusion: It was concluded that second year students have more knowledge about pulpal defects when compared to first and third year. This research had helped the students in filling the knowledge about pulpal defects .

Keywords: pulpal defects, innovative technique, novel method, pulp stone, pulpitis.

INTRODUCTION:

The dental pulp occupies the centre of each tooth and consists of soft connective tissue. The pulp is housed in the pulp chamber of the crown and in the root canal of the root(1). The pulp present in the crown is called coronal pulp and the pulp present in the root is called radicular pulp(2).

The shape of the pulp therefore resembles the shape of the tooth in which it is housed.Apical foramen and Accessory canals are used to supply blood.(3) The pulp is basically a loose connective tissue that contains supporting elements such as blood vessels and nerves(4). The cells of the pulp contain fibroblast, undifferentiated mesenchymal cells, odontoblast,defense cells, pulpal stem cells, blood vessels, lymph vessels, nerves and nerve endings.(5)

Pulp stones are discrete calcifications that form within the pulp chamber(6). They may lie free within the pulp, adhere to the chamber wall, or become embedded in dentin(7).(8)It is believed that the calcification initially forms around a central nidus of collagen fibrils, ground substance, or necrotic cell remnants(9). Internal root resorption (IRR) is a pathologic phenomenon characterized by the loss of dentine as a result of clastic cell action(10). It occurs in conditions of pulpal inflammation(11).

Trauma (avulsed/luxated/fracture) is the most common cause of external resorption(12). Depending on the type of injury, severity of the injury, and maturity of the root and pulp, different types of external root resorption may be observed(13).The students should know more about the histology and pathology of pulp which helps them in narrowing down the diagnosis and treating them accordingly.(14)Thus, this study is to evaluate the knowledge about pulpal defects among the dental undergraduate students. (15)

MATERIALS AND METHOD

This is a questionnaire based cross-sectional study conducted among 100 undergraduate students from a private dental college.A sum of 10 questions were circulated through google forms including demographic details and the questions were based on the previously known knowledge on how to read an article. Data was collected and analyzed using a software program called SPSS Statistics version 23.Chi square test was used to analyze and comparative bar graphs were plotted and it is statistically significant only if the p value is less than 0.05.

Question	Option 1	Option 2	Option 3

Age	17	18	19
Year of study	First year	Second year	Third year
Are you aware of the following clinical picture ?	Pulpitis	Pulp polyp	Pink tooth
Are you aware of the following clinical picture ?	Pink tooth	Pulp polyp	Pulp stone
Are you aware of the following clinical picture ?	True pulp stones	False pulp stones	Blood thrombi
Are you aware of the following clinical picture ?	False pulp stones	True pulp stones	Dentin
Do you know how diffuse linear calcification is discovered ?	Radio Capacity	Radiolucency	Radio opacity
Are you aware of the defence cells present during the pulp inflammation ?	Odontoblast	Fibroblast	Plasma cells
Do you know where the diffuse linear calcification develops?	Cementum	Dentin	Pulp canal
Do you know the causes of external resorption ?	Orthodontic Braces	Abrasive toothpaste	Calculus
Identify which of the following is not true.	Orthodontic forces leads to pulpal inflammation	Vitality depends on both blood and nerve supply	Pulp forms reparative dentin

Identify which of the following is not true.	C fibers are slow conducting fibres	C fibres produce dull pain	C fibres have large diameter

RESULT

In this present study, most of the respondents were under the age of 18(47.06%) followed by 29(35.29%), 17 (21.76%). In our present study, 67.33% of the population were aware of Pulpitis whereas 18.85% of the population were not aware about pulpitis**(Figure 1).** In our study 78.22% of the population are aware about pulp stone whereas 21% are not aware about pulp stone. **(Figure 2).** In our study 68% of the people are aware about true pulp stone whereas 32% of the population are not aware about true pulp stone**(Figure 3).**In our study 67.33% of the population are not aware about true pulp stone whereas 31.68% of the population are aware about false pulp stone **(Figure 4).**In our study 88.12% of the population are aware about radiolucency whereas 10.89% of the population are not aware about radiolucency **(Figure 5).**In our study 24.4% of the people are aware about plasma cell and 72% of the population are not aware about plasma cell**(Figure 6).** In our study 54.7% of the population are aware about pulp canal whereas 46% of the population are not aware about pulp canal**(Figure 8).** In our study 68% of the people are aware about resorption whereas 32% of the population are not aware**(Figure 9).** In our study 45.54% of the population are aware about blood and nerve supply whereas 59% of the population are not aware about blood and nerve supply **(Figure 10).** In our study, 41% of the population were aware that (vitality depends on both Blood and nerve supply) whereas 59%were not aware that vitality does not depend on both blood supply and nerve supply **(Figure 11).** In our study the majority of the population 46% were aware that (C fibres have larger diameter) whereas 54% were not aware that C fibers have smaller diameter **(Figure 12).** The Pearson chi-square test was used to determine the relationship between year of study and the number of responses for pulpitis. Majority of second year students respondents (33%) were more aware of pulpitis than first year 22% and third year 21%. Pearson chi square test shows p value 0.300 ($p>0.05$). Hence it is statistically insignificant **(Figure 13).** The Pearson chi-square test was used to determine the relationship between the year study and number of responses for pulp stone. Majority of second year students respondents 33% were more aware about pulp stone and first year 33% and third year 13%. Pearson chi square test shows p value 0.001 ($p<0.05$) hence it is statistically insignificant **(Figure 14).** The Pearson chi-square test was used to determine the relationship between year of study and number of responses for external resorption. Majority of respondents in second year 33% were more aware about external resorption than first year 22% and third year 13%. Pearson chi-square test shows P value is 0.106 which is statistically significant. **(Figure 15).** Pearson chi-square test was used to determine the relationship between year of study and number of respondents who were aware of pulpal Defects and the percentage was observed to be 34.14% of the second year students followed by 12.94% of first year students and 10.73% of third-year students were aware of pulpal defects and the P value is 0.016 ,($p<0.05$)hence it is statistically significant.

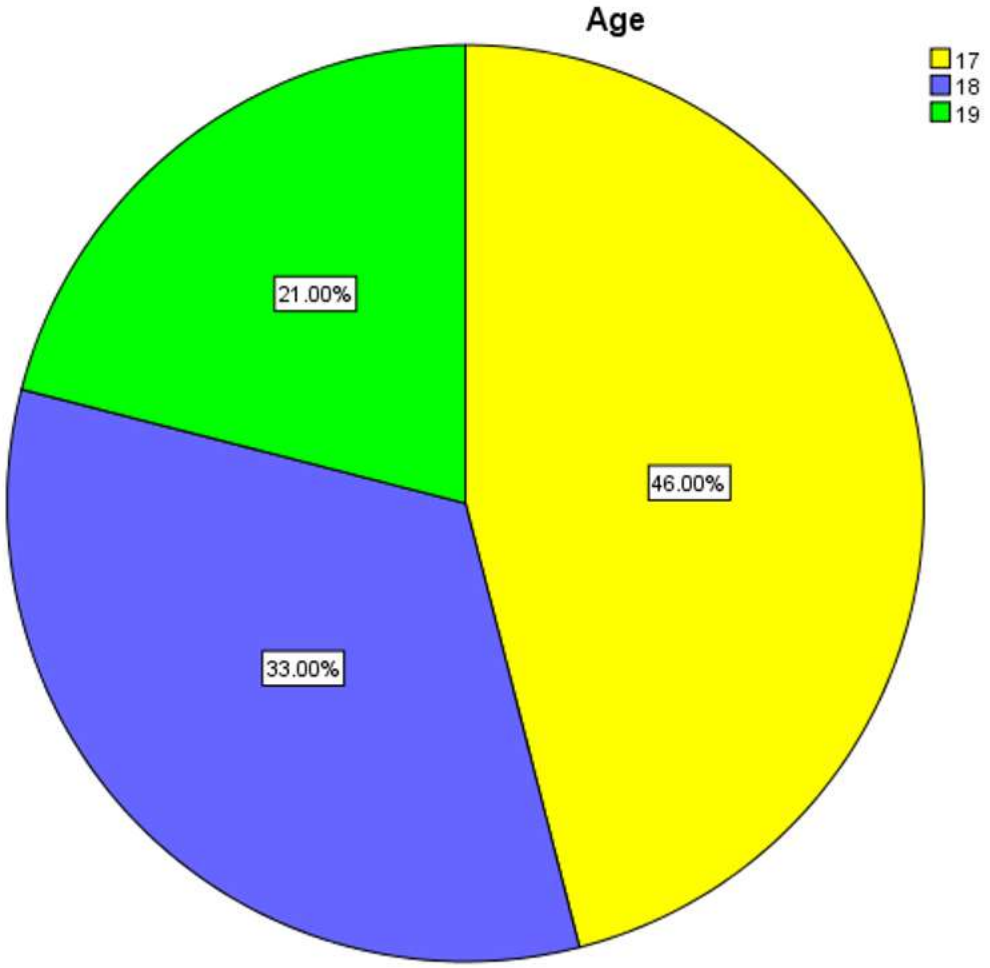

Figure 1: The pie chart shows the age of the respondent. Here the yellow colour indicates the age group of 17 , purple blue colour indicates age group of 18,light green colour indicates age group of 19. Majority 46% of the population are at the age of 17 (33%) whereas 18 (33%) and 19 (21%).

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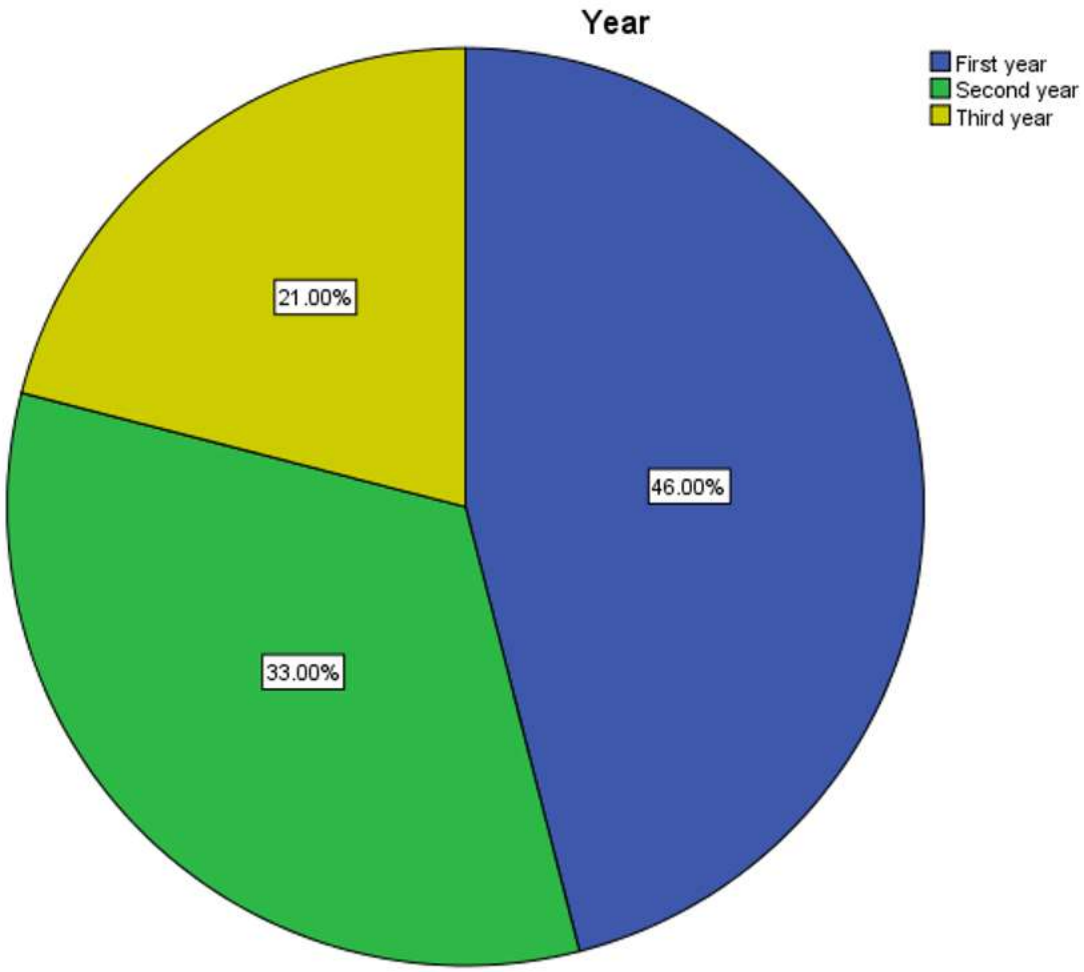

Figure 2: The pie chart shows that the response from the year of students and the blue coloured part indicates first year and a green colour indicates second year and ash green colour indicates the third year. Majority 46 % were first year students , 33 % were second year and 21% were third year students.

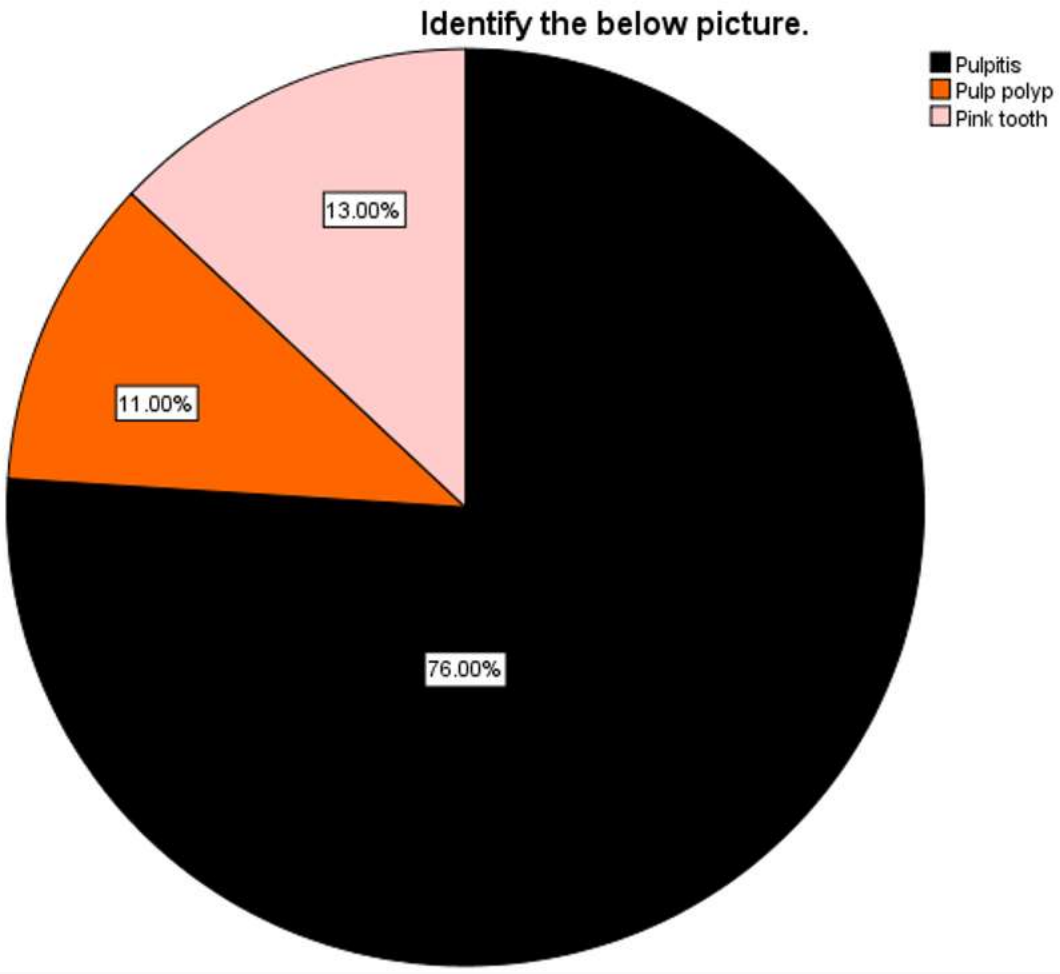

Figure 3: The pie chart shows the response for the pictorial representation of pulpitis. Black coloured part indicates pulpitis, orange colour indicates pulp polyp and pink colour indicates pink tooth. Majority 76% of the population were aware (pulpitis) whereas 11 % (pulp polyp) and 13 % (pink tooth) were unaware about pulpitis.

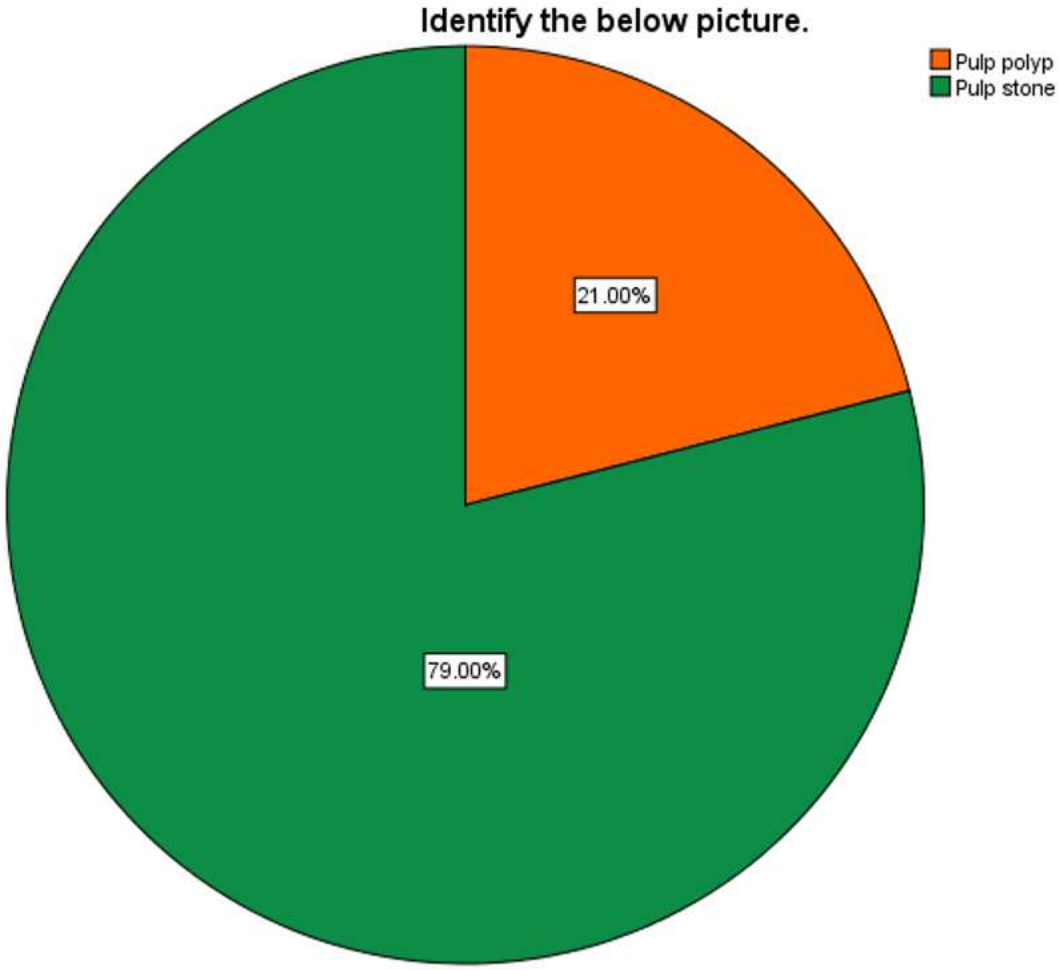

Figure 4: The pie chart shows the response to identify the picture. The dark green coloured part indicates pulp stone , orange colour indicates pulp polyp .Majority 79% of the population were aware (pulpstone) whereas 21 % (pulp polyp) were unaware.

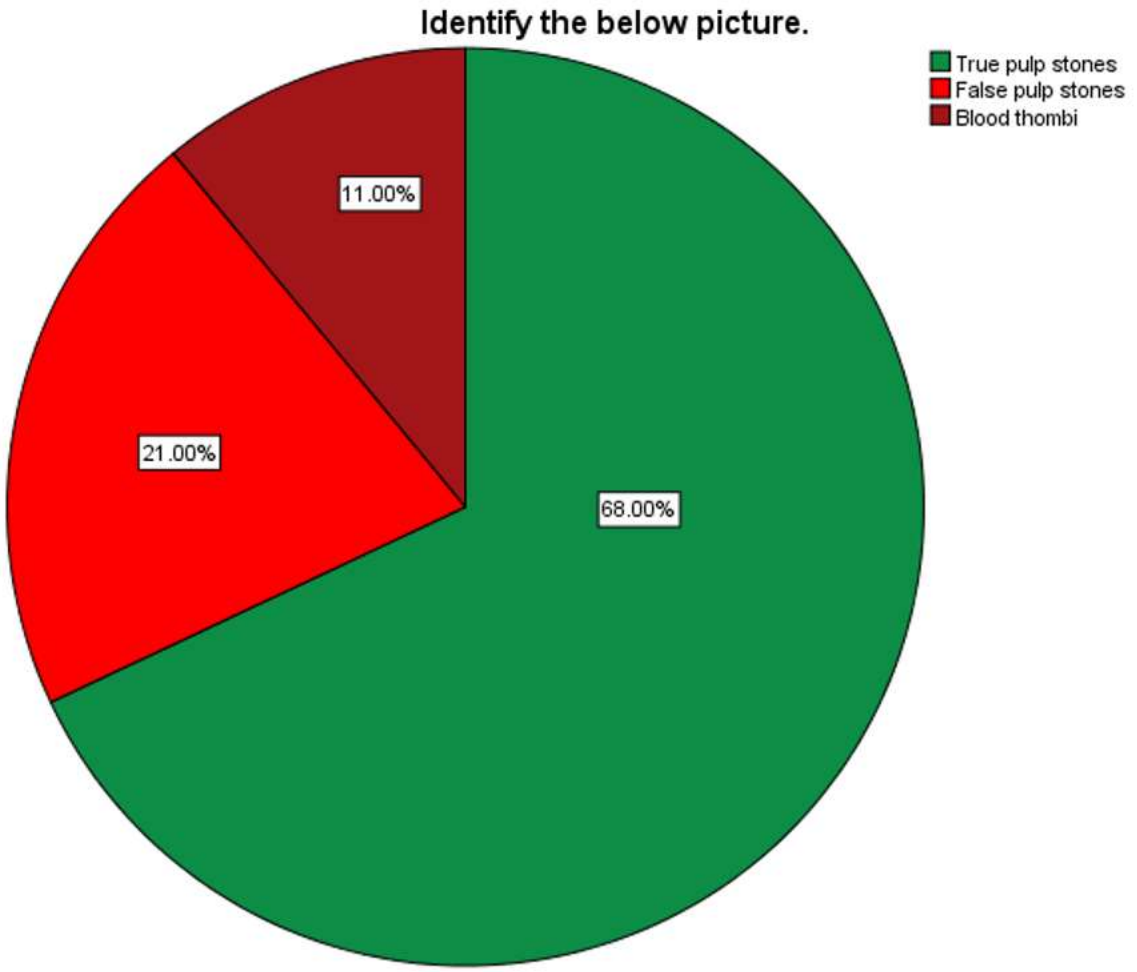

Figure 5: The pie chart shows the response to identify the below picture. The dark green coloured part indicates true pulp stone , red colour indicates false pulp stone and dark red colour indicates blood thrombi.Majority 68 % of the population were aware (true pulp stone) whereas 21% (pulp polyp) and 11% (blood thrombi) were unaware.

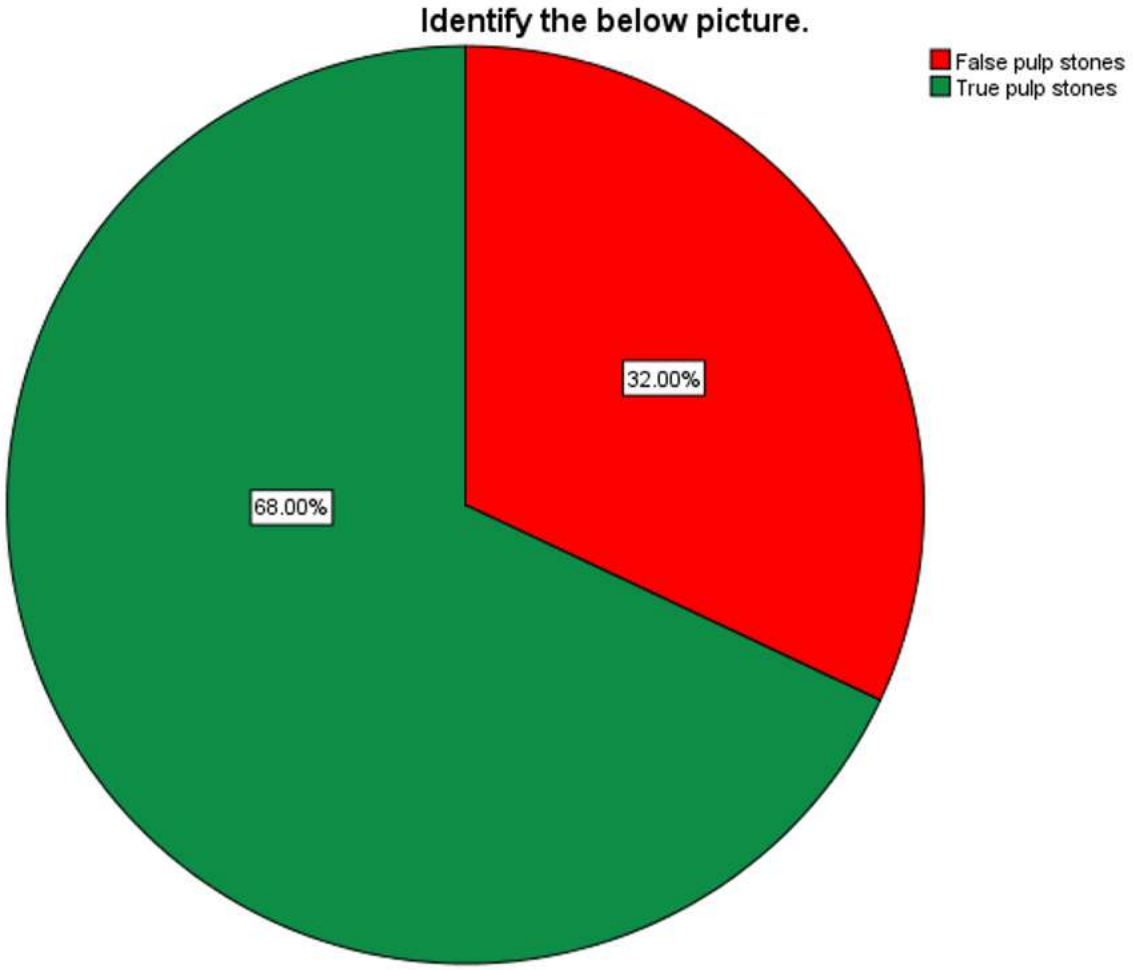

Figure 6: The pie chart shows the response for the question identifying the below picture. The dark green coloured part indicates true pulp stone and red colour indicates false pulp stone. Majority 68% of the population were not aware about (true pulp stone) where 32% (false pulp stone) were unaware .

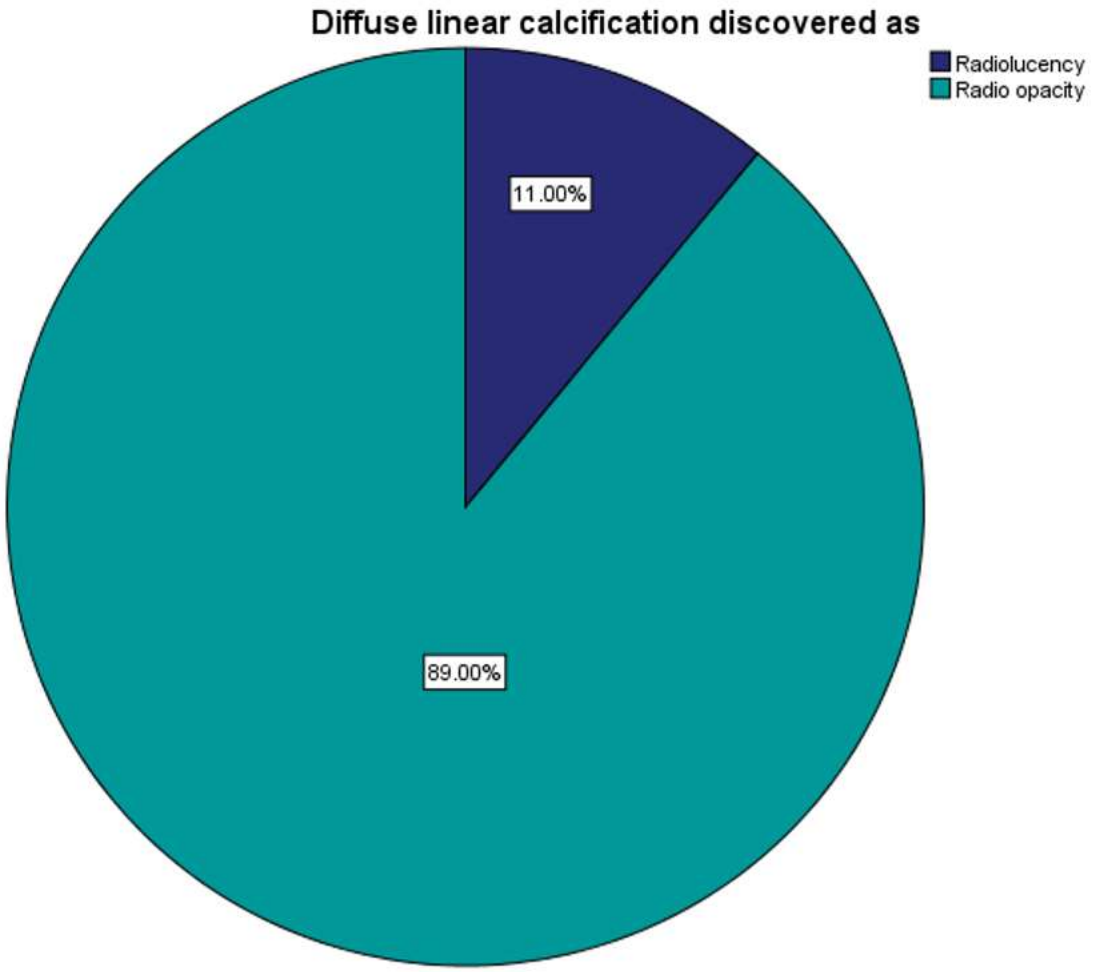

Figure 7: The pie chart shows the response for diffuse linear calcification. The light blue coloured indicates radiopacity and dark blue colour indicates radiolucency.Majority 89% of the population were aware that pulp stone appeared as radiopacity and 11% radiolucency were unaware.

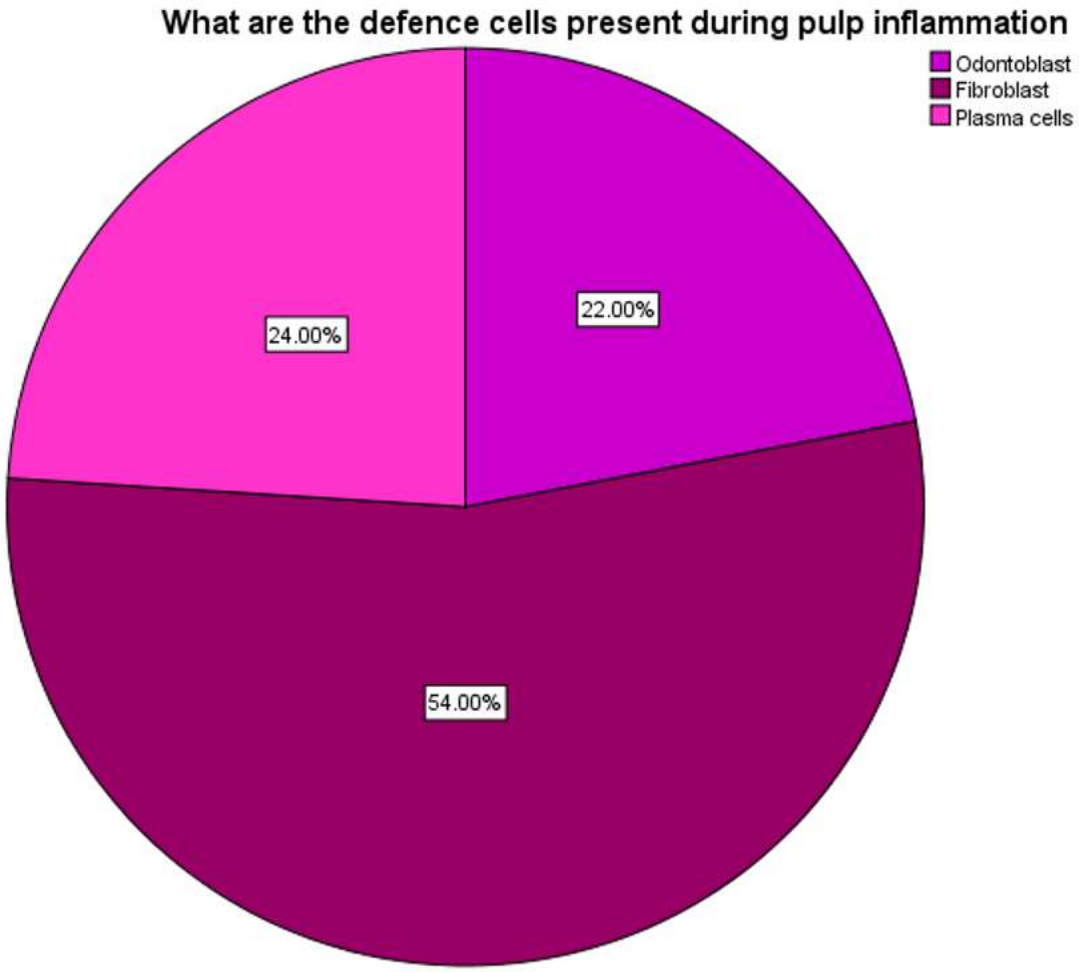

Figure 8: The pie chart shows the response for the defence cells present during pulp inflammation. The maroon colour indicates fibroblast, pink colour indicates plasma cells and purple colour indicates odontoblast. Majority of the population were not aware that 54 % (fibroblast) ,and 22% odontoblast whereas 24% (plasma cells) were aware.

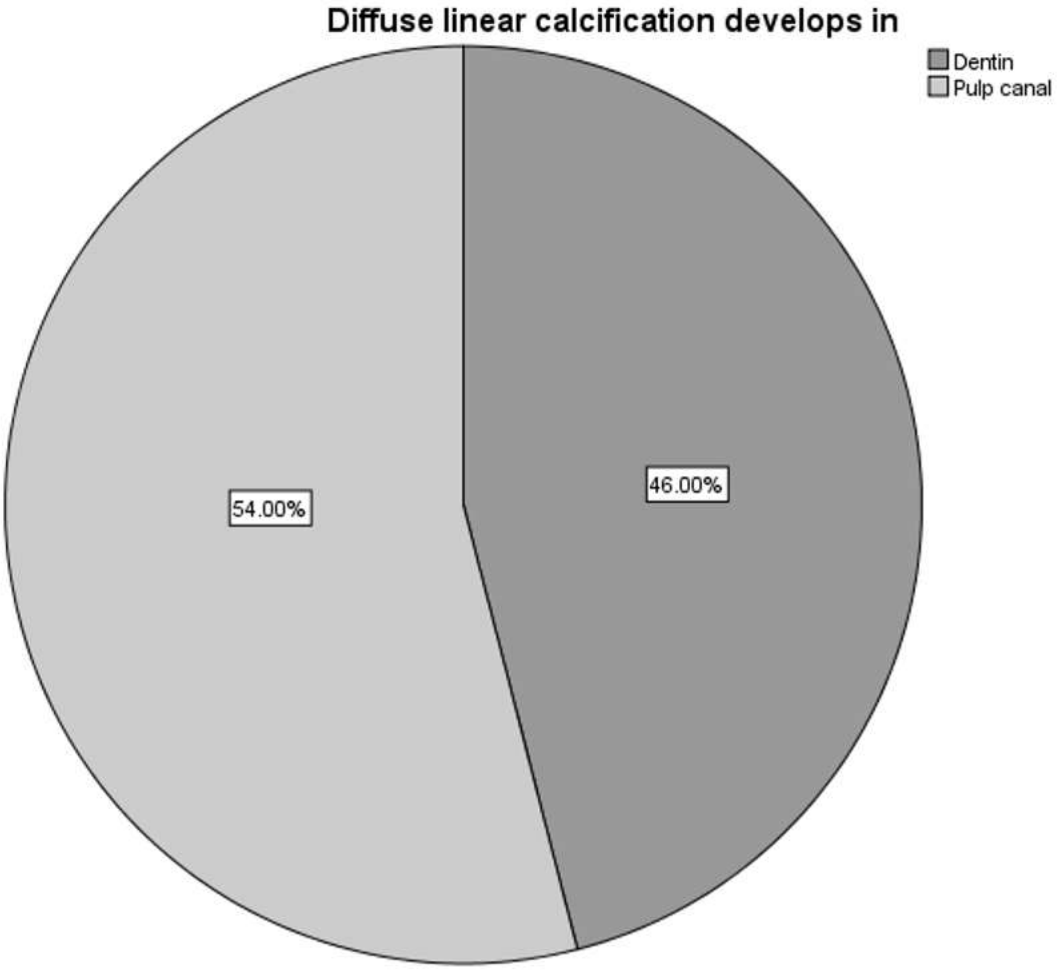

Figure 9 : The pie chart shows the response for development of diffuse linear calcification. The light grey coloured indicates pulp canal and dark grey colour indicates dentin. Majority 54% of the population were aware it is (Pulp Canal) whereas 46% (Dentin) were not aware.

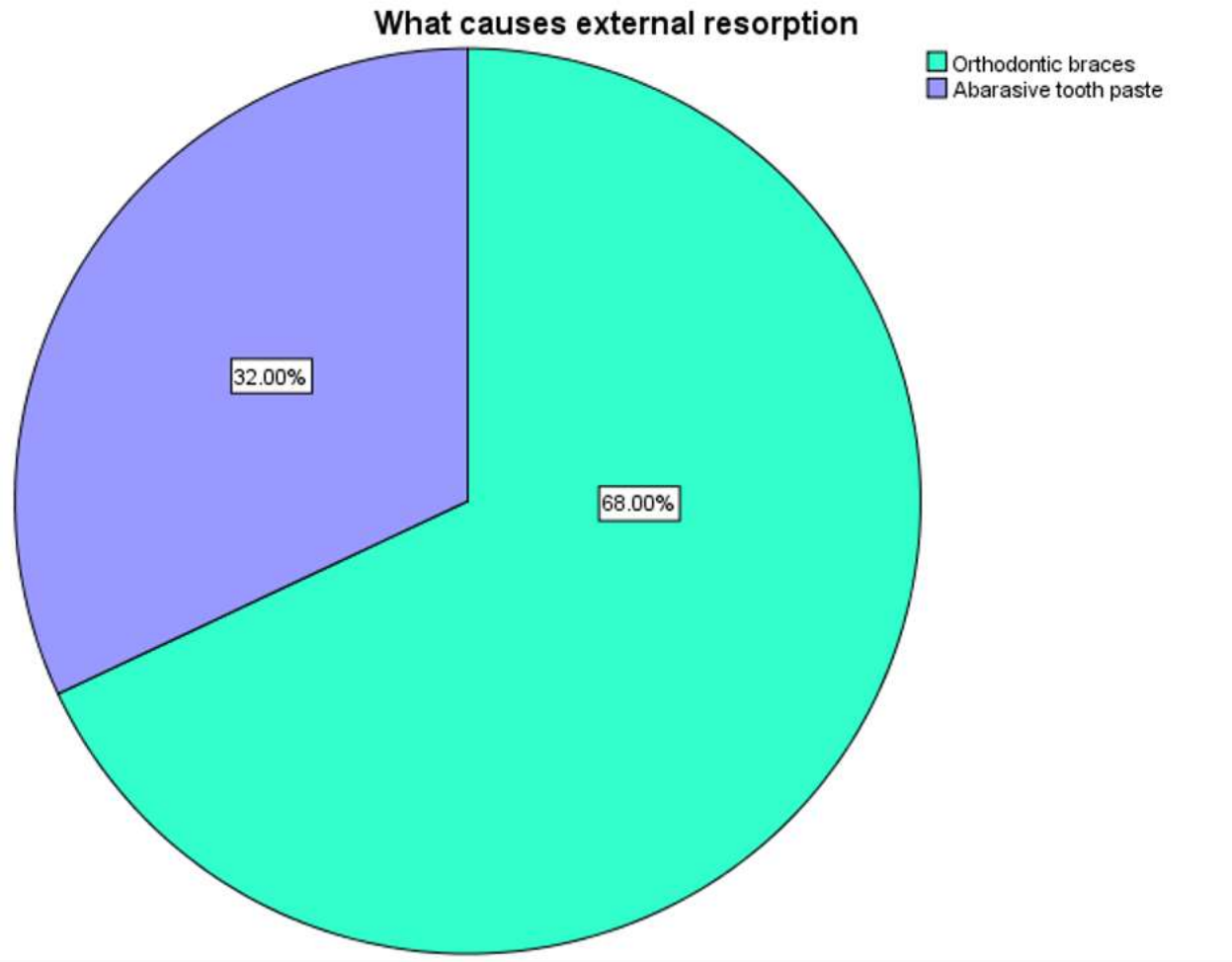

Figure 10: The pie chart shows the response for the reason for external resumption.The fluorescent light green coloured indicates orthodontic braces and light purple colour indicates abrasive toothpaste. Majority 68% of the population were aware that (orthodontic braces) whereas 32% (abrasive toothpaste) were not aware about the cause for external root resorption.

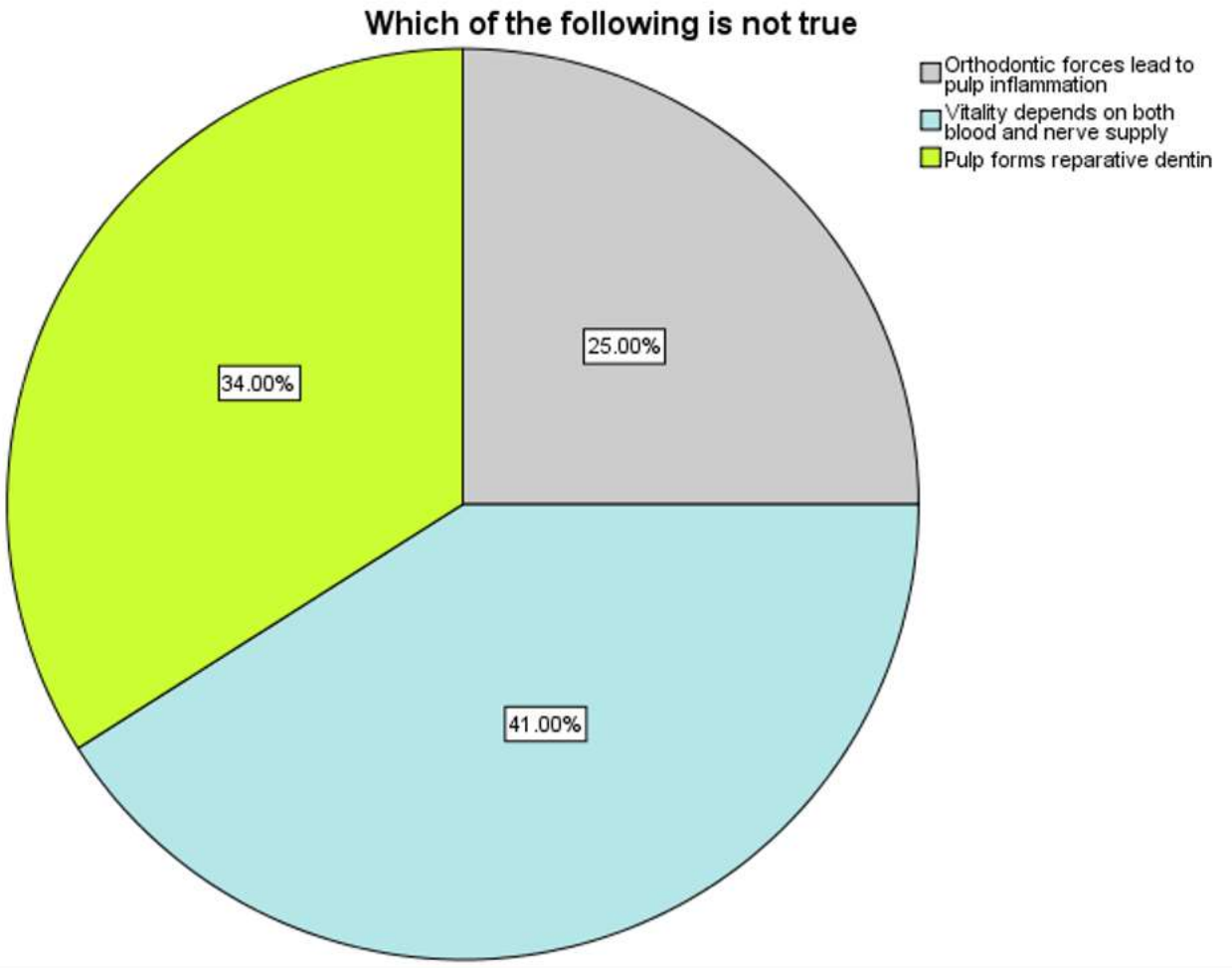

Figure 11: The pie chart Shows the response for the following statement that is not true. The light cream green colour indicates vitality depends on both Blood and nerve supply , mint green colour indicates pulp forms reparative dentin in and light grey colour indicates orthodontic forces lead to pulp inflammation. Majority 41% of the population were aware that (vitality depends on both Blood and nerve supply) whereas 34% (pulp forms reparative dentin) and 25% (orthodontic forces lead to pulp inflammation) were not aware that vitality does not depend on both blood supply and nerve supply.

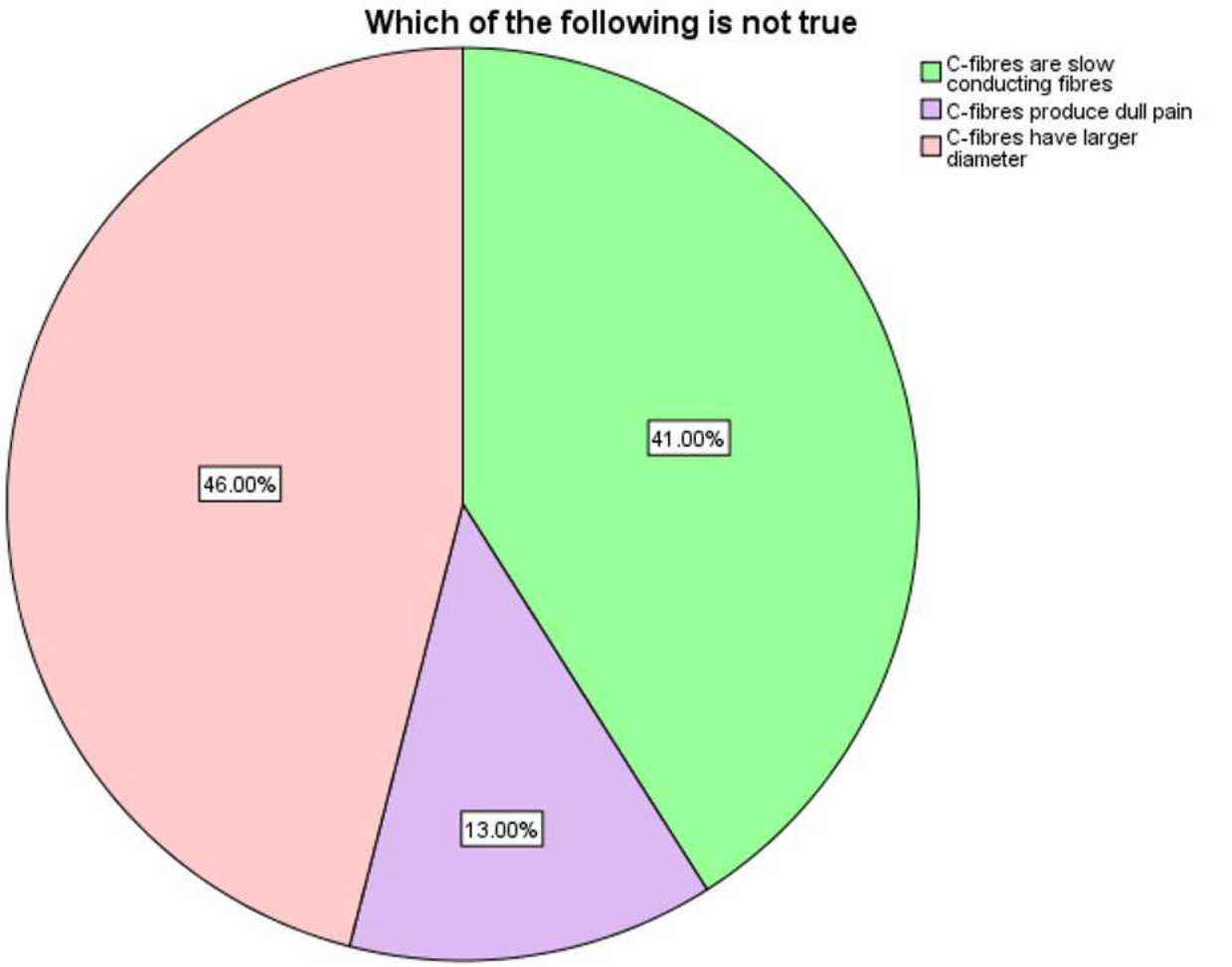

Figure 12: This pie chart shows the response for the statement that is not true. The light green coloured part indicates C fibers are slow conducting fibres, Light pink colour indicates C fibres have larger diameter and light purple colour indicates C fibres produce dull pain. Majority of the population 46% were aware that (C fibres have larger diameter) whereas 41% (C fibers are slow conducting fibres) and 13% (C fibres produce dull pain) were not aware that C fibers have smaller diameter.

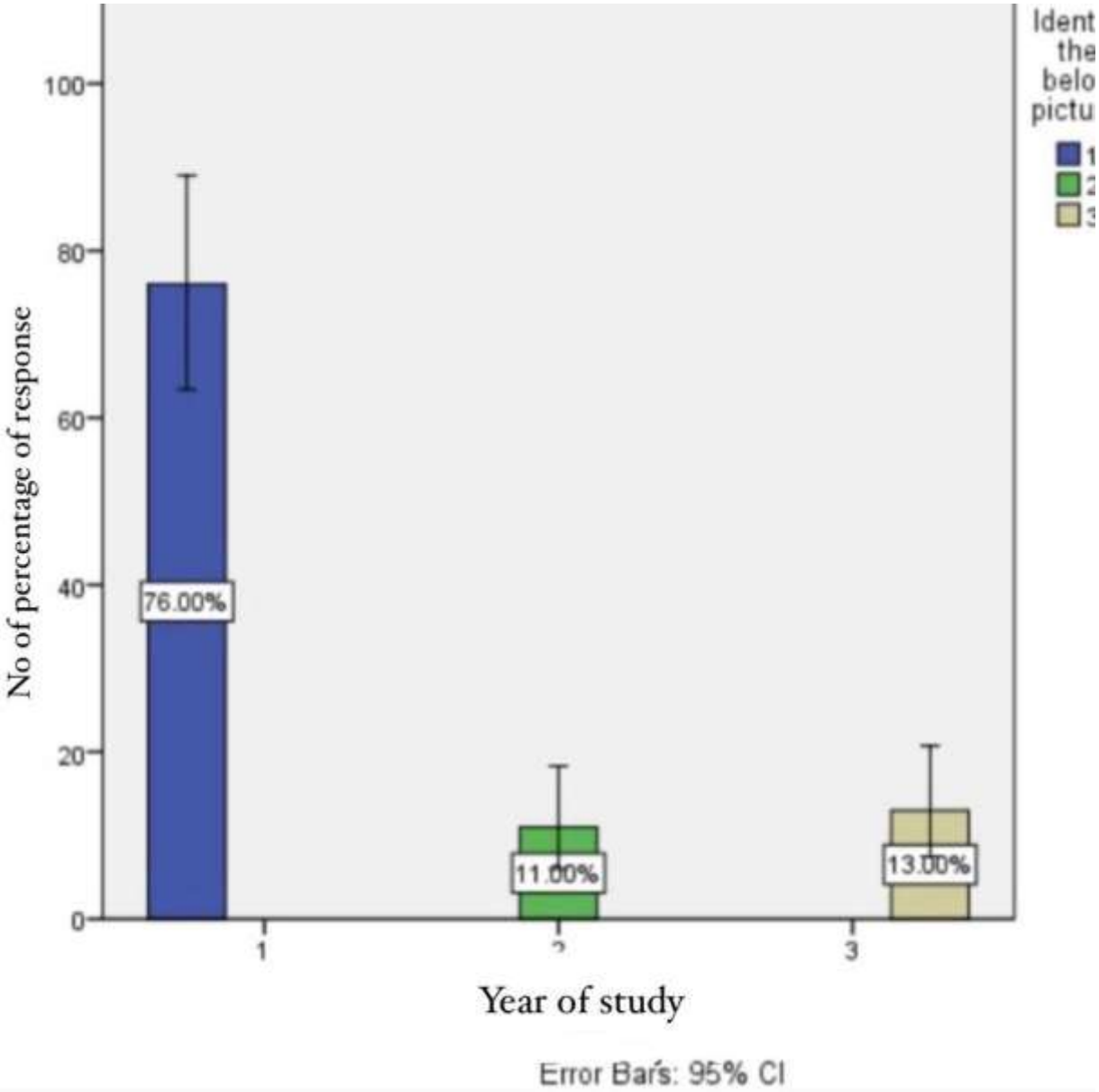

Figure 13: The bar graph represents the association between year of study and the response for pulpitis. X axis represents the year of study and Y represents percentage of responses. Blue represents pulpitis and green represents pink tooth and beige colour represents pulp polyp. Majority of second year students respondents (33%) were more aware of pulpitis than first year 22% and third year 21%. Pearson chi square test shows p value 0.300 (p>0.05). Hence it is statistically insignificant.

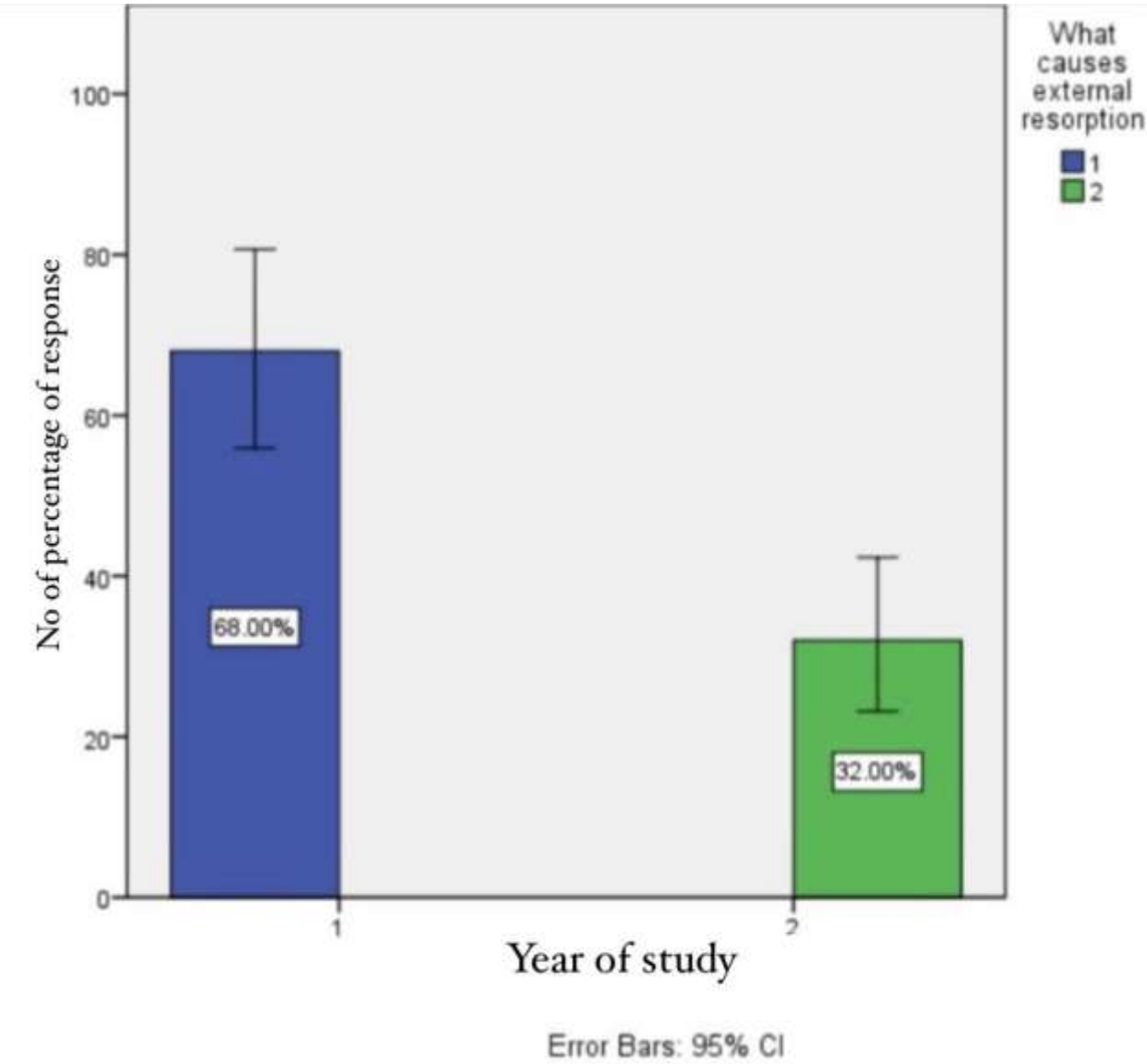

Figure 14: The Bar graph represents association between the year study and pulp stone. X axis represents the year of study and Y axis represents the percentage of responses. Green represents pulp stone and blue colour represents pulp polyp. Majority of second year students respondents 33% were more aware about pulp stone and first year 33% and third year 13%. Pearson chi square test shows p value 0.001 ($p<0.05$) hence it is statistically insignificant.

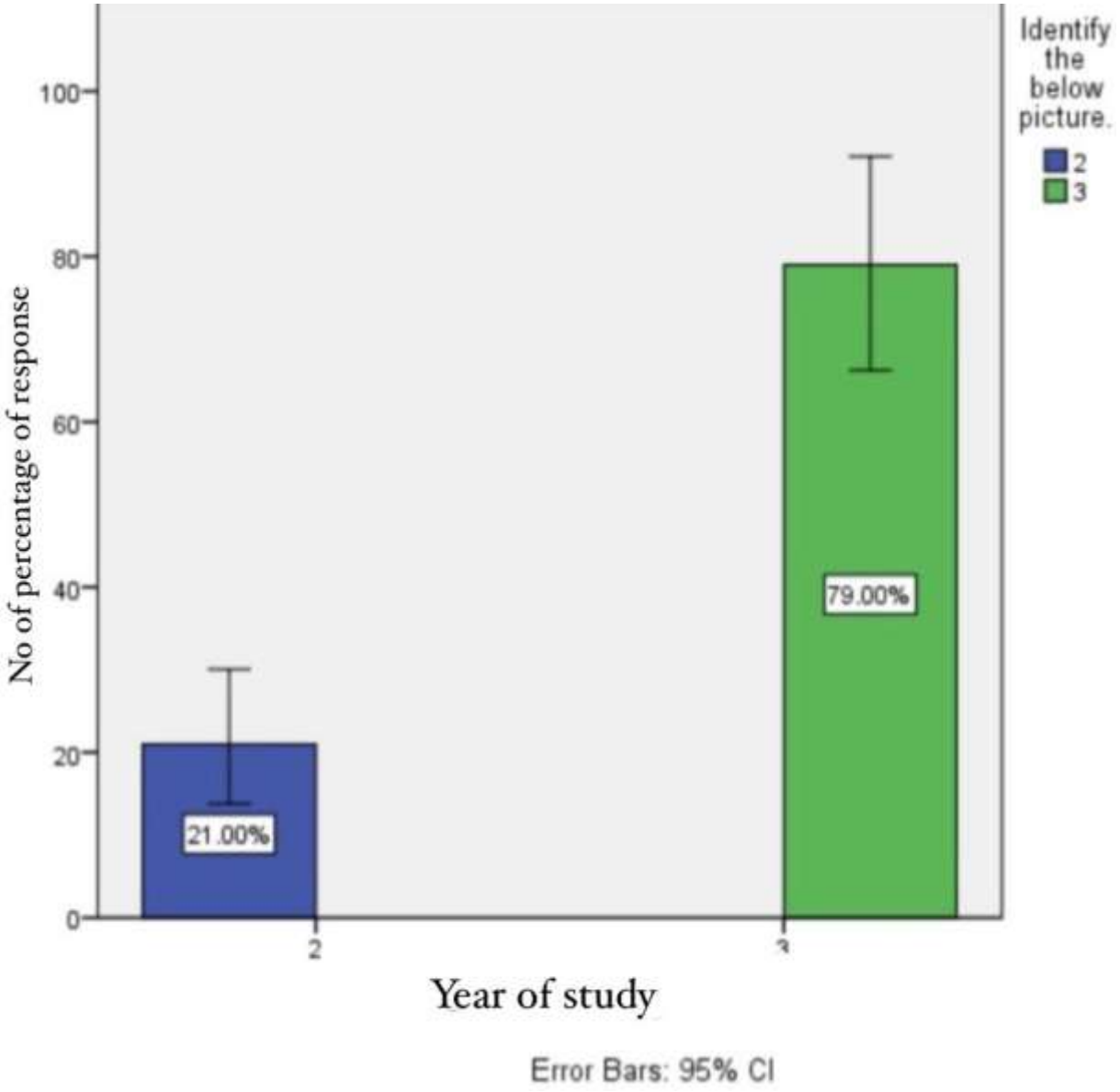

FIGURE15: The above paragraph represents the association between year of study and external resorption . X axis represents the year of study and Y axis represents the percentage of responses. Blue colour represents orthodontic braces and green colour represents abrasive toothpaste . Majority of respondents in second year 33% were more aware about external resorption than first year 22% and third year 13%. Pearson chi-square test shows P value is 0.106 which is statistically significant.

DISCUSSION

In our present survey, the majority of students' responses were from their first year (61%), followed by second (18 %) and third year students (22 %). This study found that 43.14% of first-year students were aware of pulpal defects,followed by 6.94 % of second-year students, 17.73 % of third-year students, and. As a result of the current study, it is evident that first-year students were more aware of pulpal defects.(7)

Calcification in the pulp is one of the age changes in pulp that may be nodular or diffuse calcifications(16). Variation in size and morphology of the crystallites composing the pulp stones may represent different forms of calcium phosphate (17). Large, free pulp stones, which appeared spherical in outline and had concentric laminations following demineralization, had an electron dense central zone surrounded by a less dense peripheral zone about 2–3 μm in width (17,18). In the present study, 56.24% of the population have knowledge about pulp stones and 64% of the population were more aware about the clinical picture of pulpstone and it's quantitative defect(19).

Any tooth may be affected by irreversible pulpitis, it is not restricted to particular age groups, it usually occurs as a direct result of dental caries, a cracked tooth or trauma and thus tends to occur more frequently in older patients(20). (6)The involved tooth is usually not sensitive to percussion, and palpation tests do not produce an untoward reaction(21) (22). In the present study, 78.43 percent of the population were aware about pulpitis. On the other hand, 28.43% of the participants were aware of pink teeth(23) (24). It would seem that in a primary molar with proximal caries and suspected pulp involvement the removal of the coronal pulp alone would render the pulp free from inflammation in most cases(25) . In the present study, 76.46% of the population have knowledge of pulpal inflammation and their quantitative defect.(12)

Internal root resorption (IRR) is a pathologic phenomenon characterized by the loss of dentine as a result of clastic cell action (26). It is observed that the age group of 17 and 18 have more knowledge about pulpal defects and the age group of 17 years have more awareness about pink tooth and pulpitis(27). (16)About 68% of the students answered correctly for the questions regarding pulpitis and 41% of the students were unaware about pulpitis(28). Also, 77% of the students answered correctly for the questions regarding internal resorption and 31% of the students were unaware about internal resorption(29). 80% of the students answered correctly for the questions regarding pulp stone and 20% were unaware about pulp stone(30) (31). The students should know more about the histology and pathology of pulp which helps them in narrowing down the diagnosis and treating them accordingly(32). Thus, this study is to evaluate the knowledge about pulpal defects among the dental students(33) (34). Therefore it is observed that the second year students were more aware about pulpal defects and also they had adequate knowledge and information about the developmental pulpal defects(35) (36). The survey was conducted among 100 participants and a simple random sampling method was used to select the participants hence the same study has to be conducted with more participants(37)(10) Making more interactive sessions and exercises regarding pulp and pulpal defects will make them remember more about the subject(38)(9)

CONCLUSION

It is important for the students to know about pulpal defects and its causes for the proper diagnosis and appropriate treatment. This study concludes that second year students have adequate knowledge regarding pulpal defects. This study has to be conducted in a larger population for better accuracy.

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CONFLICT OF INTEREST:

All the authors declare that there was no conflict of interest in present study.

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REFERENCE

1. Hannah R, Ramani P, WM Tilakaratne, Sukumaran G, Ramasubramanian A, Krishnan RP. Author response for “Critical appraisal of different triggering pathways for the pathobiology of pemphigus vulgaris—A review” [Internet]. Wiley; 2021. Available from: https://publons.com/publon/47643844
2. Shinoda S, Murayama Y, Okada H. Immunopathological role of pulpal tissue components in periapical pathosis. I. Detection of “new” antigens in modified dog pulpal extracts [Internet]. Vol. 12, Journal of Endodontics. 1986. p. 388–95. Available from: http://dx.doi.org/10.1016/s0099-2399(86)80072-3
3. Provenza DV, Vincent Provenza D. The Blood Vascular Supply of the Dental Pulp with Emphasis on Capillary Circulation [Internet]. Vol. 6, Circulation Research. 1958. p. 213–8. Available from: http://dx.doi.org/10.1161/01.res.6.2.213
4. Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students. Eur J Dent. 2020 Dec;14(S 01):S105–9.
5. Gutmann JL, Lovdahl PE. Problem Solving in the Differential Diagnosis of Bony Defects Resulting from Pulpal and Periodontal Pathosis [Internet]. Problem Solving in Endodontics. 2011. p. 70–96. Available from: http://dx.doi.org/10.1016/b978-0-323-06888-8.00004-0
6. R H, Ramani P, Ramanathan A, R JM, S G, Ramasubramanian A, et al. CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene. Oral Surg Oral Med Oral Pathol Oral Radiol. 2020 Sep;130(3):306–12.
7. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. Clin Oral Investig. 2020 Sep;24(9):3275–80.
8. Fernandes M, Menezes L, De Ataide I. Management of invasive cervical resorption using a surgical approach followed by an internal approach after 2 months due to pulpal involvement. J Conserv Dent. 2017 May;20(3):214–8.
9. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. J Oral Pathol Med. 2019 Apr;48(4):299–306.
10. Antony JVM, Ramani P, Ramasubramanian A, Sukumaran G. Particle size penetration rate and effects of smoke and smokeless tobacco products - An invitro analysis. Heliyon. 2021 Mar;7(3):e06455.
11. Pashley DH. The influence of dentin permeability and pulpal blood flow on pulpal solute concentrations [Internet]. Vol. 5, Journal of Endodontics. 1979. p. 355–61. Available from: http://dx.doi.org/10.1016/s0099-2399(79)80060-6
12. Sarode SC, Gondivkar S, Sarode GS, Gadbail A, Yuwanati M. Hybrid oral potentially malignant disorder: A neglected fact in oral submucous fibrosis. Oral Oncol. 2021 Jun 16;105390.

13. Clarke NG. Periodontal defects of pulpal origin: Evidence in early man [Internet]. Vol. 82, American Journal of Physical Anthropology. 1990. p. 371–6. Available from: http://dx.doi.org/10.1002/ajpa.1330820312
14. R H, Hannah R, Ramani P, Tilakaratne WM, Sukumaran G, Ramasubramanian A, et al. Author response for "Critical appraisal of different triggering pathways for the pathobiology of pemphigus vulgaris—A review" [Internet]. 2021. Available from: http://dx.doi.org/10.1111/odi.13937/v2/response1
15. Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students [Internet]. Vol. 14, European Journal of Dentistry. 2020. p. S105–9. Available from: http://dx.doi.org/10.1055/s-0040-1721296
16. Chandrasekar R, Chandrasekhar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. Prog Orthod. 2020 Oct 12;21(1):38.
17. Korkmaz YN, Aydin ZU, Sarioglu B. Orthodontic Treatment and Pulp Stone Formation: Is There a Relationship? [Internet]. Clinical and Experimental Health Sciences. 2019. Available from: http://dx.doi.org/10.33808/clinexphealthsci.600144
18. Memon M, Kalhoro FA, Shams S, Arain S. PULP STONE; [Internet]. Vol. 25, The Professional Medical Journal. 2018. p. 992–6. Available from: http://dx.doi.org/10.29309/tpmj/18.3756
19. da C Lima T, Santos RS, Silva SYS, de A Santos D, da C Silva S, de A Gomes A, et al. VOCs profile of Colletotrichum spp. as a potential tool for quality control of açaí pulp. Food Chem. 2021 May 18;362:130150.
20. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. Eur J Dent. 2018 Jan;12(1):67–70.
21. Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. Eur J Dent. 2018 Jan;12(1):21–6.
22. Al-Natour B, Rankin R, McKenna R, McMillan H, Zhang SD, About I, et al. Identification and validation of novel biomarkers and therapeutics for pulpitis using connectivity mapping. Int Endod J [Internet]. 2021 May 8; Available from: http://dx.doi.org/10.1111/iej.13547
23. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. Toxicol Mech Methods. 2019 May;29(4):276–90.
24. Cooper RA. A balanced scorecard approach to fibre supply for Canfor Pulp Limited Partnership [Internet]. Available from: http://dx.doi.org/10.24124/2010/bpgub1459
25. Goldberg M. Pulp Anatomy and Characterization of Pulp Cells [Internet]. The Dental Pulp. 2014. p. 13–33. Available from: http://dx.doi.org/10.1007/978-3-642-55160-4_2
26. Mota de Almeida FJ, Hassan D, Nasir Abdulrahman G, Brundin M, Romani Vestman N. CBCT influences endodontic therapeutic decision-making in immature traumatized teeth with suspected pulp necrosis: a before-after study. Dentomaxillofac Radiol. 2021 Jun 4;20200594.
27. Raj Preeth D, Saravanan S, Shairam M, Selvakumar N, Selestin Raja I, Dhanasekaran A, et al. Bioactive Zinc(II) complex incorporated PCL/gelatin electrospun nanofiber enhanced bone tissue regeneration. Eur J Pharm Sci. 2021 May 1;160:105768.

28. Sundaram R, Nandhakumar E, Haseena Banu H. Hesperidin, a citrus flavonoid ameliorates hyperglycemia by regulating key enzymes of carbohydrate metabolism in streptozotocin-induced diabetic rats. Toxicol Mech Methods. 2019 Nov;29(9):644–53.
29. Alsawalha M, Rao CV, Al-Subaie AM, Haque SKM, Veeraraghavan VP, Surapaneni KM. Novel mathematical modelling of Saudi Arabian natural diatomite clay. Mater Res Express. 2019 Sep 4;6(10):105531.
30. Karunagaran M, Murali P, Palaniappan V, Sivapathasundharam B. Expression and distribution pattern of podoplanin in oral submucous fibrosis with varying degrees of dysplasia – an immunohistochemical study [Internet]. Vol. 42, Journal of Histotechnology. 2019. p. 80–6. Available from: http://dx.doi.org/10.1080/01478885.2019.1594543
31. Ramachandran N, Singh S, Podar R, Kulkarni G, Shetty R, Chandrasekhar P. A comparison of two pulp revascularization techniques using platelet-rich plasma and whole blood clot. J Conserv Dent. 2020 Nov;23(6):637–43.
32. Yu J, Li M, Zhan D, Shi C, Fang L, Ban C, et al. Inhibitory effects of triterpenoid betulin on inflammatory mediators inducible nitric oxide synthase, cyclooxygenase-2, tumor necrosis factor-alpha, interleukin-6, and proliferating cell nuclear antigen in 1, 2-dimethylhydrazine-induced rat colon carcinogenesis. Pharmacogn Mag. 2020;16(72):836.
33. Shree KH, Hema Shree K, Ramani P, Herald Sherlin, Sukumaran G, Jeyaraj G, et al. Saliva as a Diagnostic Tool in Oral Squamous Cell Carcinoma – a Systematic Review with Meta Analysis [Internet]. Vol. 25, Pathology & Oncology Research. 2019. p. 447–53. Available from: http://dx.doi.org/10.1007/s12253-019-00588-2
34. Mukhopadhyay BK, Tampy KK. A method for the quantitative determination of mechanical wood pulp, unbleached chemical pulp, and bleached chemical pulp fibres in paper and pulp [Internet]. Vol. 60, The Analyst. 1935. p. 529. Available from: http://dx.doi.org/10.1039/an9356000529
35. Zafar A, Sherlin HJ, Jayaraj G, Ramani P, Don KR, Santhanam A. Diagnostic utility of touch imprint cytology for intraoperative assessment of surgical margins and sentinel lymph nodes in oral squamous cell carcinoma patients using four different cytological stains. Diagn Cytopathol. 2020 Feb;48(2):101–10.
36. Pedano MS, Yoshihara K, Li X, Camargo B, Van Landuyt K, Van Meerbeek B. Experimental resin-modified calcium-silicate cement containing N-(2-hydroxyethyl) acrylamide monomer for pulp tissue engineering. Mater Sci Eng C Mater Biol Appl. 2021 Jul;126:112105.
37. Sarode SC, Gondivkar S, Gadbail A, Sarode GS, Yuwanati M. Oral submucous fibrosis and heterogeneity in outcome measures: a critical viewpoint. Future Oncol. 2021 Jun;17(17):2123–6.
38. Prithiviraj N, Yang GE, Thangavelu L, Yan J. Anticancer Compounds From Starfish Regenerating Tissues and Their Antioxidant Properties on Human Oral Epidermoid Carcinoma KB Cells. In: PANCREAS. LIPPINCOTT WILLIAMS & WILKINS TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA …; 2020. p. 155–6.