

Knowledge Attitude and Practice on Vital Pulp Therapy in Clinical Practice.

Type of manuscript: Survey

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Abstract:

Introduction:

The dental pulp is the living tissue of the teeth and its vitality is essential for long-term tooth survival. Vital pulp therapy (VPT) is a treatment which is conducted to preserve the vitality and function of the coronal or remaining radicular pulp tissue that has been compromised but not destroyed by trauma, caries, or restorative procedures in a healthy state. The cariously exposed pulp is treated based on the maturity of the tooth. Various VPT techniques are indirect pulp treatment (IPT), direct pulp treatment (DPT), partial pulpotomy, and full pulpotomy in vital permanent teeth.

Aim: The aim of the study is to assess the knowledge, attitude and practice of vital pulp therapy in clinical practise.

Materials and methods:

An online questionnaire-based study which was conducted among the undergraduate students. The data was collected from the filled questionnaires and was entered in Microsoft Excel spreadsheet. The statistical program SPSS was used for data management and analysis.

Results:

In this survey, a total of 100 participants responded. When the awareness on vital pulp therapy was asked, 91.43% said that they were aware and 8.57% said that they were not aware. When a question regarding the knowledge on indirect pulp capping was asked, 56.19% said affected dentine, 23.81% said affected pulp, 7.62% said affected enamel and 12.38% said all the above. Then we asked if they have practised direct pulp capping in permanent teeth. 89.52% answered that they have done before and 10.48% answered they have not done before.

Discussion:

In the present study, a total of 100 responses were collected. Most of the participants knew about vital pulp therapy and they were aware about it. The main aim of VPT is to maintain pulpal health in teeth that have been exposed to caries, trauma, restorative procedures, and anatomic abnormalities by stimulating pulpal cells to produce dentin to provide durable seal that protects the pulp.

Conclusion:

This study concluded that the knowledge, attitudes, and practices regarding vital pulp therapy among general dental practitioners are adequate. But still most of them need to be educated about the importance of preserving pulp. The participants in this study showed fair-to-good knowledge and attitude toward VPT of young permanent teeth.

Keywords:

vital pulp therapy, knowledge, attitude, practice, pulp capping, pulpotomy, innovative technique.

Running title: KAP survey on vital pulp therapy.

INTRODUCTION:

The dental pulp is the living tissue of the teeth and its vitality is essential for long-term tooth survival. Vital pulp therapy (VPT) is a treatment which is conducted to preserve the vitality and function of the coronal or remaining radicular pulp tissue that has been compromised but not destroyed by trauma, caries, or restorative procedures in a healthy state (1). An important benefit for preservation of vital pulp is the protective resistance to mastication forces compared with a root-canal-filled tooth (2). VPT, namely direct pulp capping, partial pulpotomy, or full pulpotomy, should be performed only in teeth with reversible pulpitis with no periapical pathologies or in teeth with either mechanical pulp exposure or recently traumatic pulp exposure (3). The presence of an adequate *blood supply* is required for the maintenance of the pulp vitality (4). In addition, the presence of a *healthy periodontium* is necessary for success

of VPT, and teeth with moderate to severe periodontal disease are not suitable candidates for the treatment (5). The cariously exposed pulp is treated based on the maturity of the tooth. Various VPT techniques are indirect pulp treatment (IPT), direct pulp treatment (DPT), partial pulpotomy, and full pulpotomy in vital permanent teeth. Promoting apexogenesis is the classical aim of conducting pulpotomy in young permanent teeth (6). Direct pulp capping (DPC) and partial pulpotomy (PP) are two VPT procedures, wherein a material is applied on the exposed pulp (7). Both procedures demonstrate favourable outcomes in vital permanent teeth with pulpitis or even apical periodontitis (8). High success rates above 91% were reported for VPT techniques, including indirect pulp capping, DPC, miniature pulpotomy and full pulpotomy using calcium-enriched mixture cement in mature permanent molars (9). However, for permanent teeth with carious pulp exposures, success rates for DPC are inconsistent, while that of partial or full pulpotomy is higher for 3 years or longer (10). Partial or full pulpotomy has been recommended for teeth with clinical signs and symptoms indicating irreversible pulpitis, in which the irreversibly inflamed portion of the coronal pulp could be removed (11). More recently, calcium silicate materials (CSMs) have been increasingly acknowledged as pulp capping materials, and their functional effects are mainly compared with calcium hydroxide (CH) (12). Although calcium hydroxide has long been used for pulp capping as the material of choice, it has a number of disadvantages, like insufficient adherence to dentin, dissolution of the material with time and dentin bridges with multiple tunnel defects (13). Calcium hydroxide suspensions have been found to cause liquefaction necrosis of the pulpal tissue at the surface due to its high pH (14). Mineral trioxide aggregate (MTA) is a recommended alternative to calcium hydroxide as it stimulates the formation of dentin-bridge faster, which allows pulp healing and results in high success rates in clinical practice. MTA possesses many properties like biocompatibility, antibacterial activity and is a bioactive material with good stability and outstanding sealing ability (15). A new calcium-silicate-based restorative cement called Biodentine (Septodont) has been introduced, which has similar applications as that of MTA and can be used as a dentin substitute. It stimulates the vital pulp cells and encourages reparative dentin formation when it is in direct contact with the pulp tissue (16).

In a previous study, A total of 207 students participated. The response rate was 63.8% among female students and 36.2% among male students (17). In another study, 279 MDS students responded to this survey, in which 47% were males and 53% were females (18). A total of 58 survey questionnaires were distributed. Among all 58 respondents, 24 were male and 34 were female. Of the total survey respondents, 12 (20.68%) were Private doctors, 28 (48.27%) were Government doctors, and 18 (31.03%) were from other specialties (19). A total of 100 general dental practitioners were selected from various private dental clinics in Srinagar city and were questioned using a 10 item questionnaire (20). Our team has extensive knowledge and research experience that has translate into high quality publications (21–25),(26–29),(21–25) (30). The aim of the study is to assess the knowledge, attitude and practice of vital pulp therapy in clinical practise.

Materials and Methods

This was an online questionnaire-based study which was conducted among the undergraduate students from a private dental college (SIMATS) in Chennai during February 2020. The

approval of this present study was obtained from the Institutional Ethics Committee. The study included students who were willing to participate in this questionnaire study. A predesigned validated questionnaire consisting of 16 questions which included demographic details, and questions regarding their knowledge and awareness about the vital pulp therapy was employed.

The data was collected from the filled questionnaires and was entered in Microsoft Excel spreadsheet. The statistical program SPSS was used for data management and analysis. Descriptive statistics were computed. The frequency for each domain, such as knowledge, attitude, and practice was determined after giving weightage and calculated for each option.

Results:

In this survey, a total of 100 participants responded. When the awareness on vital pulp therapy was asked, 91.43% said that they were aware and 8.57% said that they were not aware. When a question regarding the knowledge on indirect pulp capping was asked, 56.19% said affected dentine, 23.81% said affected pulp, 7.62% said affected enamel and 12.38% said all the above. Then we asked if they have practised direct pulp capping in permanent teeth. 89.52% answered that they have done before and 10.48% answered they have not done before. When knowledge on materials used for direct pulp capping, where 12.38% said Mineral trioxide aggregate, 6.67% said Zinc oxide eugenol, 7.62% said adhesive systems and 73.33% said calcium hydroxide. Then we asked if vital pulp therapy can be cost effective or not, for which 93.33% said it was cost effective and 6.67% said it was not cost effective. When the question was asked whether they have practised partial pulpotomy before, where 86.67% said that they have practised and 13.33% said that they have not done. Then we asked if it would be effective to perform vital pulp therapy on permanent teeth, where 89.52% said it would be effective and 10.48% said it wouldn't be effective. When the contraindication of calcium hydroxide in primary teeth was asked, 44.76% said that they were aware about it and 55.24% said they weren't aware. When the knowledge contraindication of direct pulp capping in primary teeth was asked, where 42.86% said that they were aware and 57.14% said that they weren't aware. Then we asked if indirect pulp capping can be done with the teeth having irreversible pulpitis, where 80% said it cannot be done and 20% said it can be done. Then the question was asked if they knew that apexification is one among vital pulp therapy, where 38.10% said that they were aware and 61.90% said that they weren't aware. Then the question was asked if they were aware that apexification provides a calcified barrier to necrotic pulp was asked, where 76.19% said that they were aware and 23.81% said that they were not aware. When knowledge on the materials for apexification was asked 73.33% said mineral trioxide aggregate, 13.33% said biodentine and 13.33% said bioceramics. Then, if they knew that the success rate of direct pulp capping with carious dentine was less, 93.33% said they were aware and 6.67% said they were not aware.

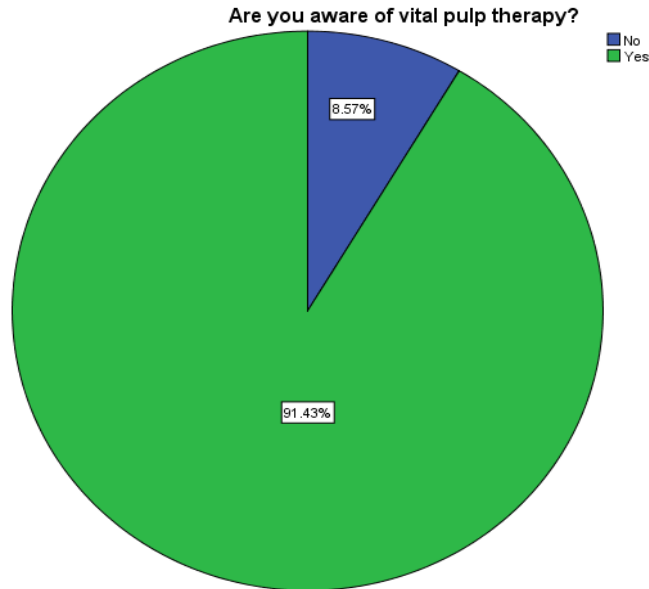


Figure 1 represents the distribution of participants based on the awareness of vital pulp therapy, where 91.43% said yes (green) and 8.57% said no (blue).

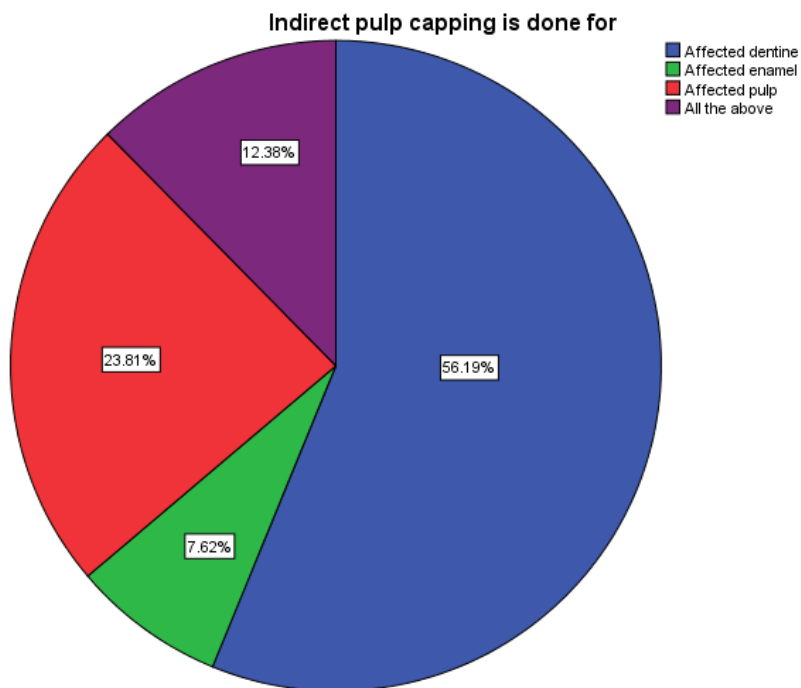


Figure 2 represents the distribution of participants based on the knowledge on indirect pulp capping, where 56.19% said affected dentine (blue), 23.81% said affected pulp (red), 7.62% said affected enamel (green) and 23.81% said all the above (purple).

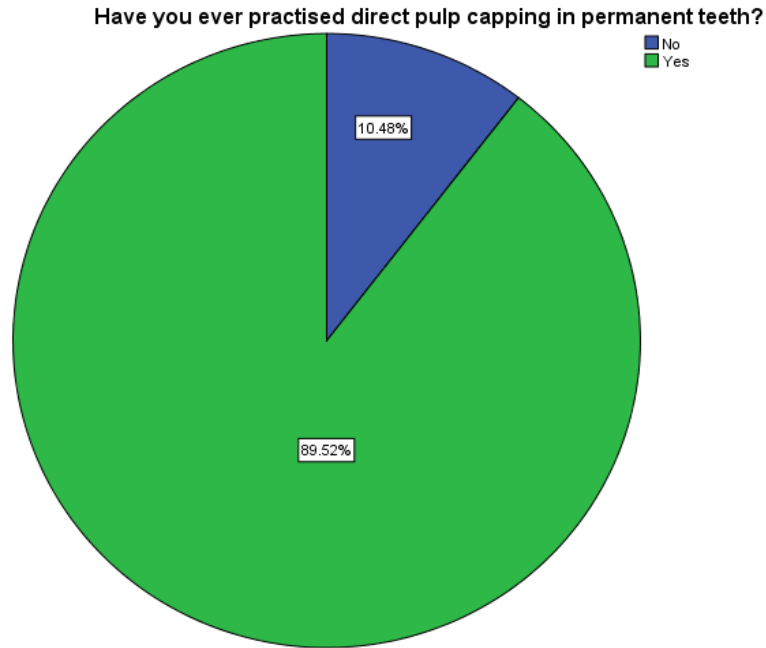


Figure 3 represents the distribution of participants based on the knowledge on direct pulp capping, where 89.52% said yes (green) and 10.48% said no (blue).

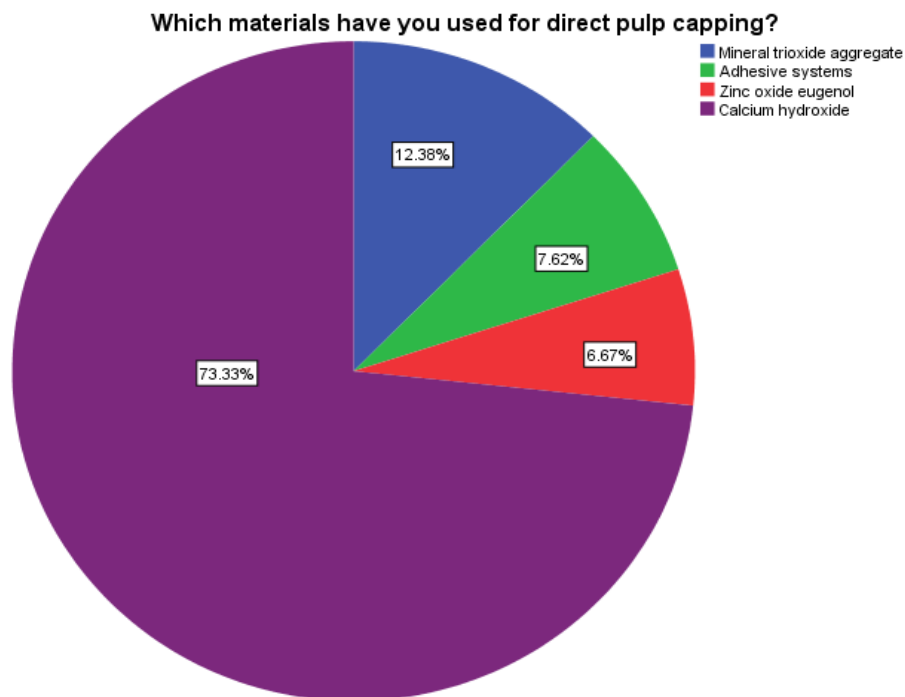


Figure 4 represents the distribution of participants based on the knowledge on materials used for direct pulp capping, where 12.38% said Mineral trioxide aggregate (blue), 6.67% said Zinc oxide eugenol (red), 7.62% said adhesive systems (green) and 73.33% said calcium hydroxide (purple).

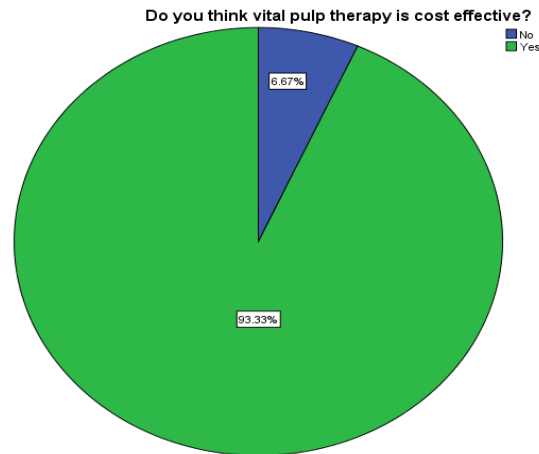


Figure 5 represents the distribution of participants based on the cost of vital pulp therapy, where 93.33% said yes (green) and 6.67% said no (blue).

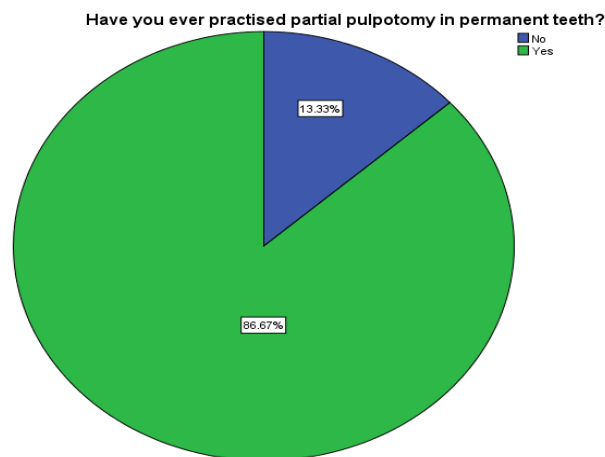


Figure 6 represents the distribution of participants based on the knowledge on partial pulpotomy, where 86.67% said yes (green) and 13.33% said no (blue).

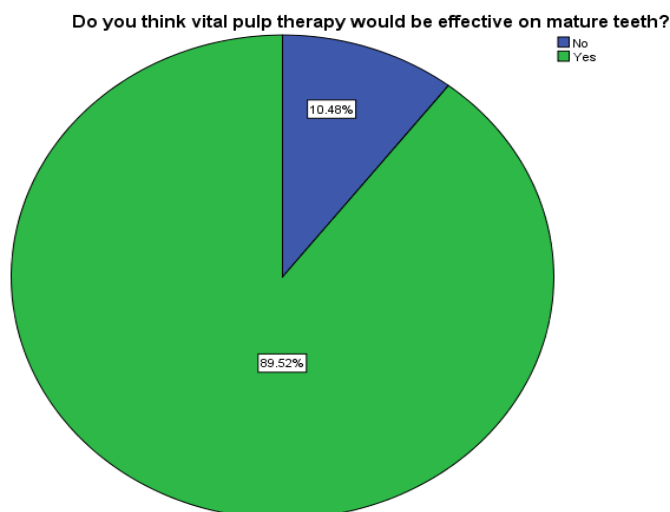


Figure 7 represents the distribution of participants based on the knowledge on vital pulp therapy, where 89.52% said yes (green) and 10.48% said no (blue).

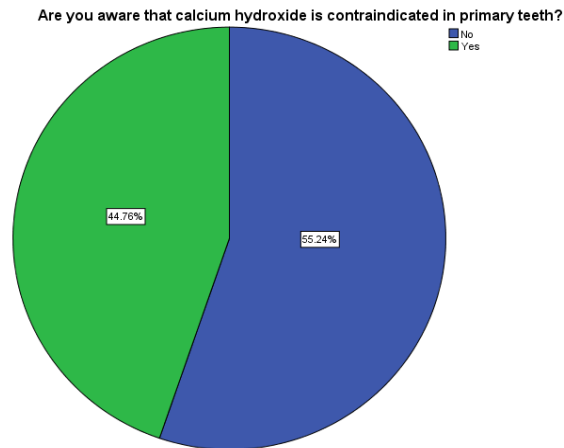


Figure 8 represents the distribution of participants based on the knowledge on calcium hydroxide, where 44.76% said yes (green) and 55.24% said no (blue).

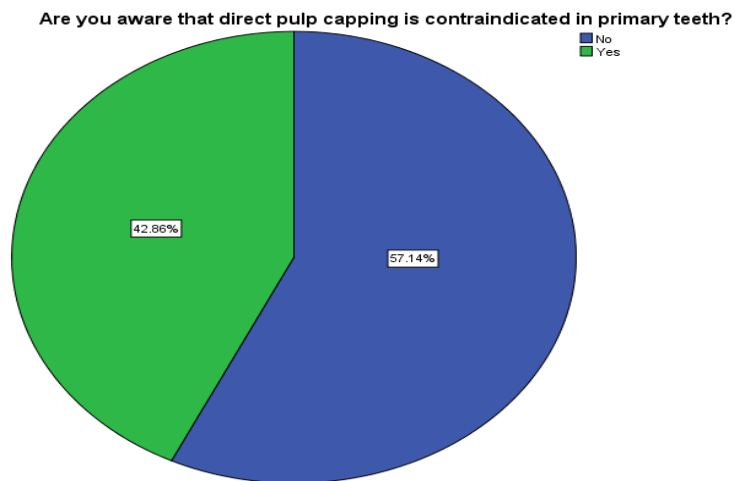


Figure 9 represents the distribution of participants based on the knowledge on contraindication of direct pulp capping in primary teeth, where 42.86% said yes (green) and 57.14% said no (blue).

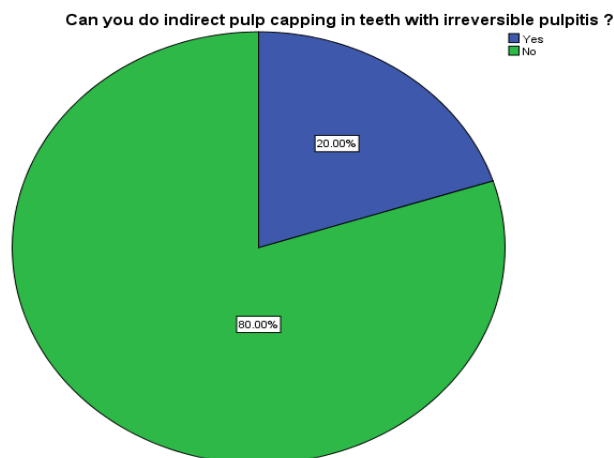


Figure 10 represents the distribution of participants based on the knowledge on indirect pulp capping, where 80% said no (green) and 20% said yes (blue).

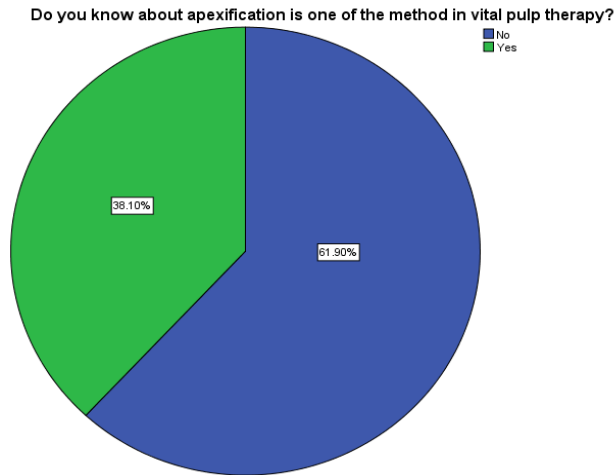


Figure 11 represents the distribution of participants based on the knowledge on apexification, where 38.10% said yes (green) and 61.90% said no (blue).

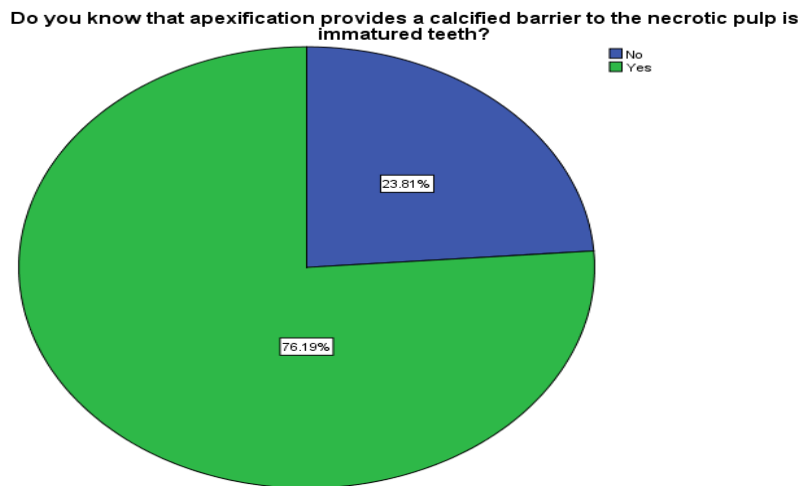


Figure 12 represents the distribution of participants based on the knowledge on apexification, where 76.19% said yes (green) and 23.81% said no (blue).

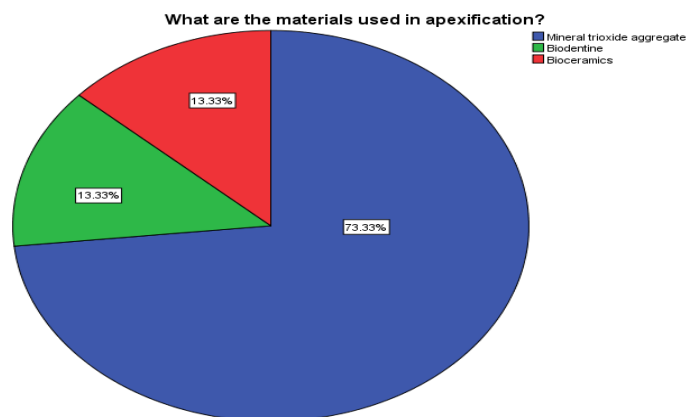


Figure 13 represents the distribution of participants based on the knowledge on materials for apexification, where 73.33% said mineral trioxide aggregate (blue), 13.33% said biodentine (green) and 13.33% said bioceramics (red).

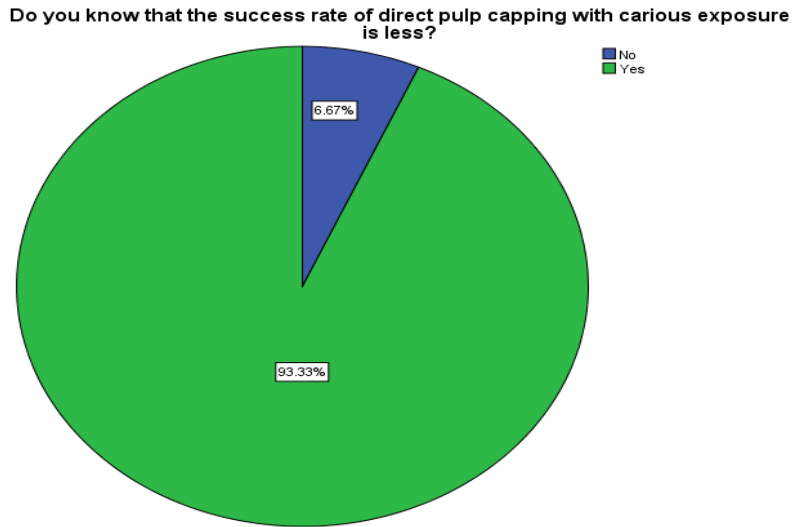


Figure 14 represents the distribution of participants based on the success rate of direct pulp capping, where 93.33% said yes (green) and 6.67% said no(blue).

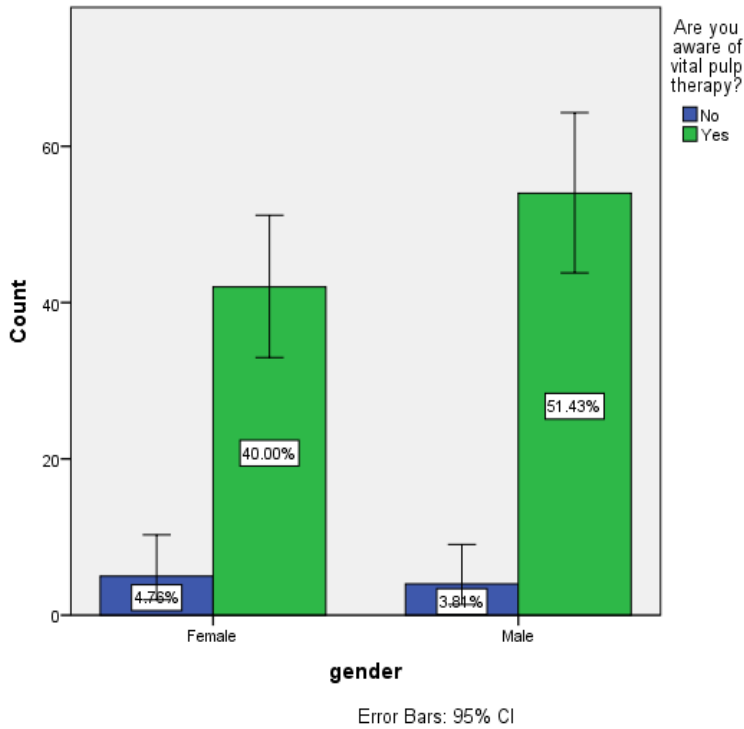


Figure 15: Bar charts representing association between gender and opinion on awareness on vital pulp therapy. X axis represents gender and Y axis represents the number of participants who responded ‘no’ (blue) and ‘yes’ (green). Both males and female population strongly agree that they are aware of vital pulp therapy, it is not statistically significant (Pearson’s chi square value = 0.464 ,df= 1 , p value= 0.496).

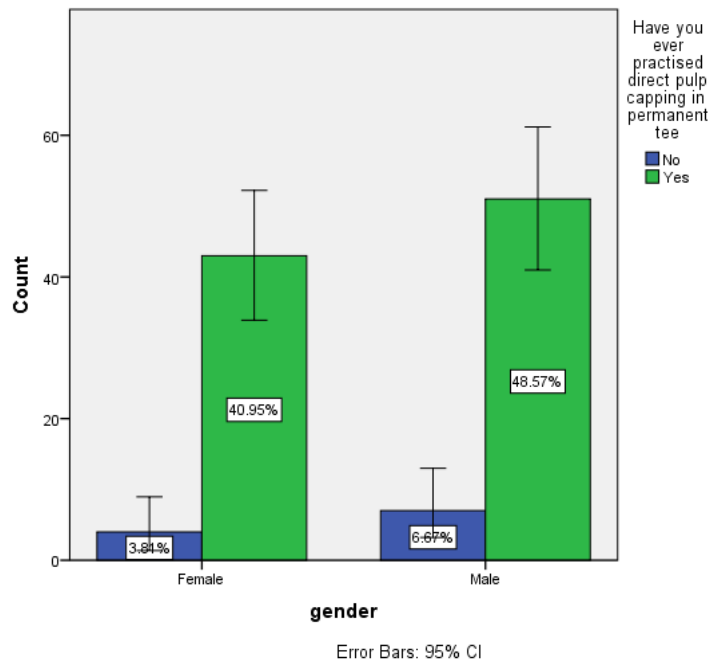


Figure 16: Bar charts representing association between gender and opinion on practising direct pulp capping. X axis represents gender and Y axis represents the number of participants who responded 'no' (blue) and 'yes' (green). Both males and female population strongly agree that they have practised direct pulp capping, however it is not statistically significant (Pearson's chi square value = 3.638 ,df= 3 , p value= 0.303).

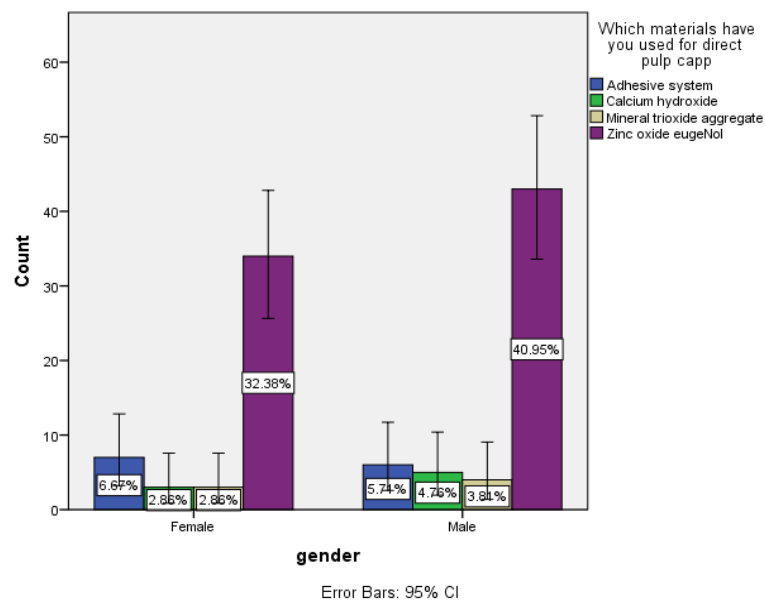


Figure 17: Bar charts representing association between gender and opinion on materials used for direct pulp capping. X axis represents gender and Y axis represents the number of participants who responded 'adhesive system' (blue), 'calcium hydroxide' (green), 'mineral trioxide aggregate' (white) and 'zinc oxide eugenol' (purple). Both males and female population strongly agree that they use calcium hydroxide, however, it is not statistically significant (Pearson's chi square value = 0.626 ,df= 3 , p value= 0.890).

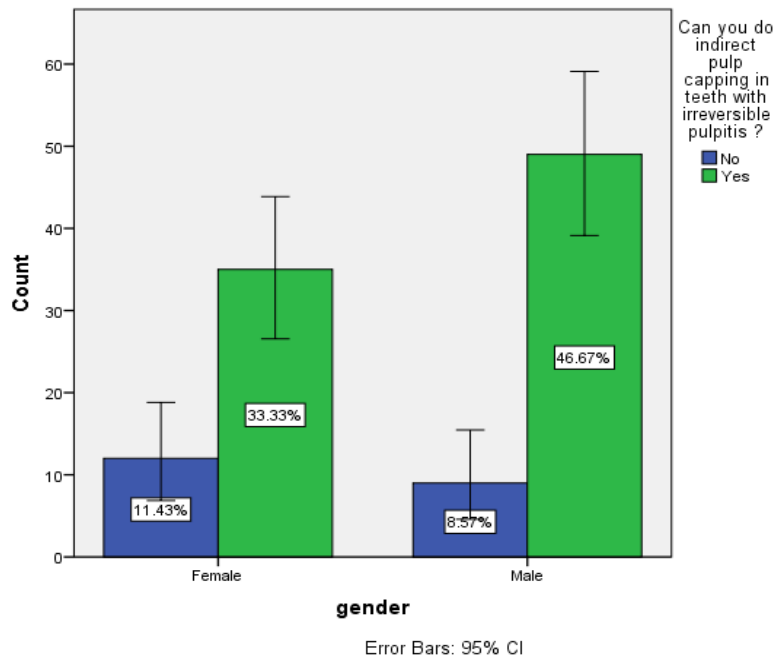


Figure 18: Bar charts representing association between gender and opinion on indirect pulp capping. X axis represents gender and Y axis represents the number of participants who responded 'yes' (green) and 'no' (blue). Both males and female population strongly agree that indirect pulp capping cannot be done in teeth with irreversible pulpitis, however it is not statistically significant (Pearson's chi square value =1.627 ,df= 1, p value= 0.202).

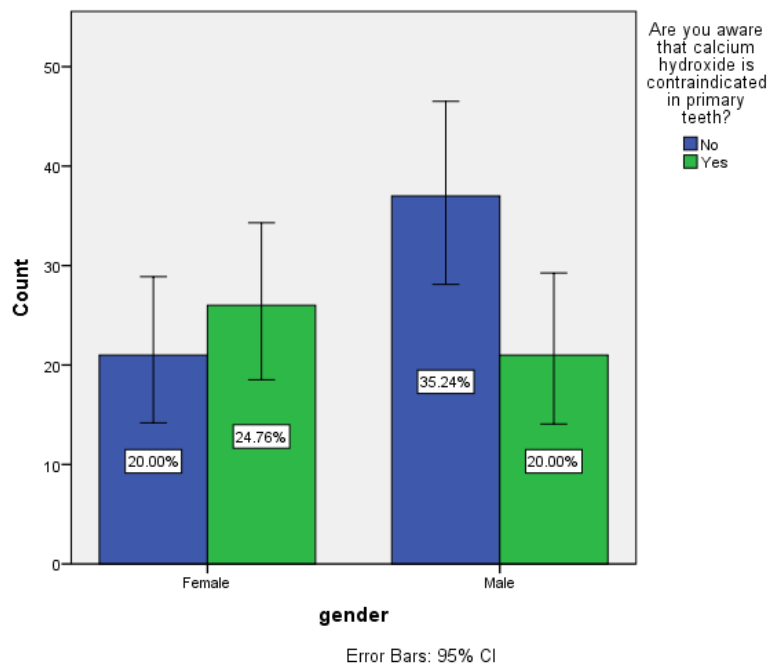


Figure 19: Bar charts representing association between gender and opinion on awareness on contraindication of calcium hydroxide in primary teeth. X axis represents gender and Y axis represents the number of participants who responded 'yes' (green) and 'no' (blue). males strongly agree that calcium hydroxide is contraindicated in primary teeth than females, hence it is statistically significant (Pearson's chi square value =3.835 ,df= 1, p value= 0.050).

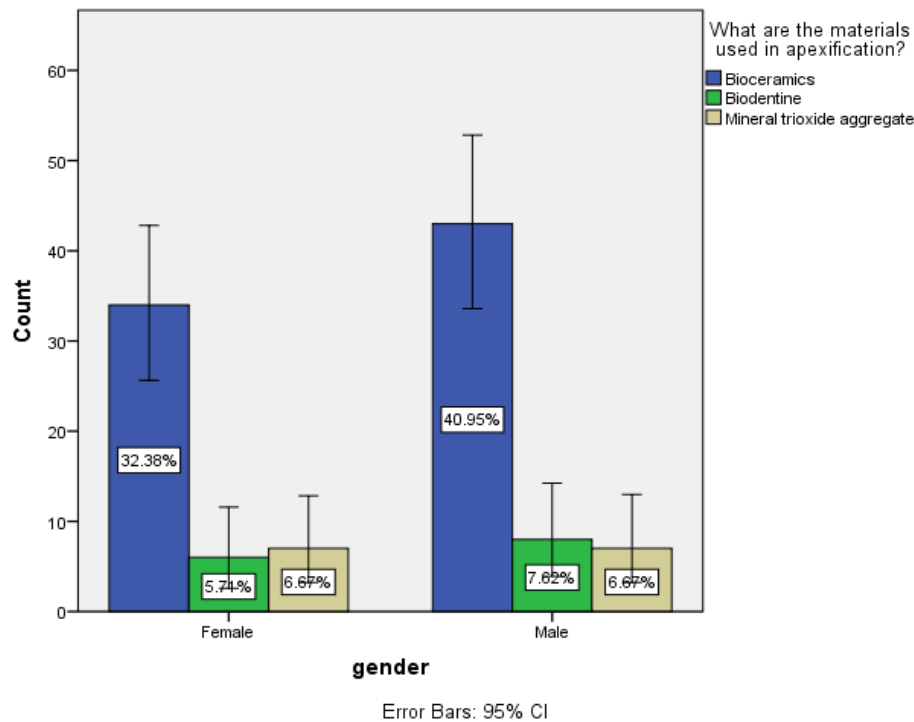


Figure 20: Bar charts representing association between gender and opinion on materials used for apexification. X axis represents gender and Y axis represents the number of participants who responded ‘mineral trioxide aggregate’ (white), ‘bioceramics’ (blue) and ‘biodentine’ (green). Both males and female population strongly agree that they use calcium hydroxide, however, it is not statistically significant (Pearson’s chi square value = 0.626 ,df= 3 , p value= 0.890).

Discussion:

In the present study, a total of 100 responses were collected. Most of the participants knew about vital pulp therapy and they were aware about it. The main aim of VPT is to maintain pulpal health in teeth that have been exposed to caries, trauma, restorative procedures, and anatomic abnormalities by stimulating pulpal cells to produce dentin to provide durable seal that protects the pulp (12). VPT plays an important role in preserving the affected immature permanent teeth with incomplete root development (9). The uniqueness of dental pulp, in that it defies visualization, makes it difficult to the clinician, and requires them to know a patient’s history, clinical symptoms, and signs, as well as undertake vitality tests, in order to achieve a proper diagnosis and treatment plan. The indications, objectives, and types of pulpal therapies depend on when the pulp is symptom free or there is reversible pulpitis, symptomatic or asymptomatic irreversible pulpitis, or a necrotic pulp (31). Treatment of a deep carious lesion depends on multiple findings: pulp involvement, periapical inflammation, pulp vitality, restorability of the affected tooth, and time till exfoliation of the tooth. The affected tooth could be vital (no symptoms and normal response to vitality test), have inflamed vital pulp but be able to heal (reversible pulpitis), have inflamed vital pulp that is unable to heal, or not have vital pulp (necrotic pulp). The success rate of primary tooth pulpotomies diminishes over time, so radiographic evaluation of the treated tooth should be repeated at least yearly (32).

Apexification is inducing the development of an uncompleted tooth root or closure of the root apex by deposition of hard tissue (33).

In previous study, the most selected material for vital pulp therapy was Mineral trioxide aggregate 67.1%. VPT should only be performed in teeth with reversible pulpitis as agreed by 57% of the participants. Nearly 71% of the DHPs mentioned that apexogenesis is a VPT procedure to encourage the physiological development and formation of the root end. Most of the participants, 72% viewed that apexification is a method to induce a calcified barrier in a root with open apex. Three-fourth 75% of the DHPs agreed that indirect pulp capping is a procedure performed in a tooth with a deep carious lesion approximating the pulp but without signs or symptoms of pulp degeneration (34). In pulpectomy procedure 44 respondents preferred zinc oxide eugenol as obturating material. 3% of study participants had poor knowledge scores, whereas only 11% of study participants had good knowledge scores regarding regenerative endodontics. The majority of study participants had poor attitude scores, that is 83 (67%), whereas only 17 (14%) of study participants had good attitude scores. Only 5 (4%) of study participants had good practice scores, whereas 98 (79%) of study participants had poor practice scores. In the present study, 57% of study participants agree or partially agree with the statement that it will take more than 20 years to take for some regenerative stem cell therapies to be used in dentistry (35). The results of this study showed that 18.7% of participants realize that successful outcomes for VPT decrease as the patient's age increases. High percentage of participants (74.4%) agreed that an open apex is present in the roots of immature teeth (36). 71.9% of participants were familiar with the definition of apexogenesis which is a VPT procedure performed to encourage continued physiologic development and formation of the root end. While 65% agreed that the objective of apexogenesis is to maintain the vitality of the radicular pulp. only half of the participants knew that apexogenesis allows generating dentine bridges at the site of pulpotomy (37). More than half of general dental practitioners (62.3%) and 84.7% of pediatric dentists did not recommend performing apexification on primary teeth (38). $\text{Ca}(\text{OH})_2$ has long been considered the universal standard for VPT materials. The introduction of $\text{Ca}(\text{OH})_2$ into dentistry is credited to Hermann in the 1920s. Desirable characteristics of $\text{Ca}(\text{OH})_2$ include an initial high alkaline pH which is responsible for stimulating fibroblasts and enzyme systems. The drawbacks of $\text{Ca}(\text{OH})_2$ include weak marginal adaptation to dentin, degradation, and dissolution over time (39). MTA has been considered as the gold standard since its introduction in dentistry due to its excellent biological and physico-chemical properties. The application of biomimetic technology has demonstrated promising results in the field of dentistry (40). Direct pulp capping of a carious pulp exposure in a primary tooth is not recommended, but can be successful in immature permanent teeth. The direct pulp cap is indicated for small mechanical or traumatic exposures when conditions for a favourable response are optimal (41).

Conclusion:

This study concluded that the knowledge, attitudes, and practices regarding vital pulp therapy among general dental practitioners are adequate. But still most of them need to be educated about the importance of preserving pulp. The participants in this study showed fair-to-good knowledge and attitude toward VPT of young permanent teeth. The main knowledge

deficiencies were observed in regards to closure of root apex and use of NaOCl as a diagnostic tool to differentiate between reversible and irreversible pulpitis. In general, there is a need to improve knowledge and attitude of dental professionals about the Vital pulp therapy by attending continuing dental educational programs.

Acknowledgement: We thank Saveetha Dental College, Saveetha University, SIMATS for supporting us to conduct the study.

Conflict of interest : The authors declare that there were no conflicts of interest in the present study.

SOURCE OF FUNDING

This study was supported by the following agencies.

- Saveetha Dental College
- SIMATS, Saveetha University
- Virtusa Consultancy Services, chennai, India.

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