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## Evaluation of Preference of Root Canal Irrigants By Students for Pulpectomy

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**Abstract:** The present study was undertaken to evaluate the preference of root canal irrigants for pulpectomy of primary teeth in at Saveetha Dental college. Retrospective data of 2438 patients was obtained and segregated who visited between June 2019 to April 2020. Once the data was obtained it was statistically analyzed using SPSS by IBM version 20. The most commonly used out of the irrigants preferred in the present study was saline (59%) followed by saline with a combination of EDTA (32.5%), followed by EDTA alone (8.4%) and the least used irrigant was a combination of saline and sodium hypochlorite (0.1%). Saline was the most preferred irrigant in both the undergraduate and postgraduate clinics. Within the limits of the present study it was observed that the most common type of irrigant that was used is saline (59.03%). Further studies are to be done to formulate a clear and distinct clinical practice guideline for pulpectomy procedure. Further awareness programmes that should be conducted to bring out better clinical outcomes and help the society holistically.

**Keywords:** EDTA; irrigant; primary; pulpectomy; saline.

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### INTRODUCTION

There are various situations (Christabel and Linda Christabel, 2015; Gurunathan and Shanmugaavel, 2016; Packiri, Gurunathan and Selvarasu, 2017) arising in children that require intervention by practitioners (Govindaraju, Jeevanandan and Subramanian, 2017b; Packiri, Gurunathan and Selvarasu, 2017; Ravikumar, Jeevanandan and Subramanian, 2017). With the advent of time, there have been various trends in the occurrence of caries in pediatric patients (Subramanyam *et al.*, 2018) and various approaches to prevent and treat it (Somasundaram, 2015; Govindaraju, 2017b; 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018).

A pulpectomy procedure may be performed on primary teeth when the coronal portion of the pulp tissue and the tissue entering the pulp canals are vital but show clinical evidence of hyperemia or if the root canals show evidence of necrosis or suppuration. It is unwise to maintain or retain untreated infected primary teeth in the oral cavity. They may be opened for drainage of the affected tissue and often remain asymptomatic for an indefinite period. However, they are a source of infection and should be treated or removed. The morphology of the root canals in primary teeth makes endodontic treatment difficult. Mature first primary molar canals are often so small that they are inaccessible even to the smallest barbed broach. If the canal cannot be properly cleansed of necrotic material, sterilized, and adequately filled, endodontic therapy is more likely to fail. The success of endodontic therapy in primary teeth strongly depends on achieving an adequate level of disinfection within the root canals. Mechanical instrumentation alone is unlikely to be sufficient in attaining such disinfection, considering the root resorption process and the complex anatomy of the root canal system, characteristic of primary molars, and the risk of damage to the permanent germ (Kargül, Tanboga and Altinok, 2010). There are various exclusive file systems have been recently developed for the purpose of performing pulpectomy in primary teeth and their efficacy has been tested with time (Jeevanandan, 2017; Jeevanandan and Govindaraju, 2018a; Panchal, Jeevanandan and Subramanian, 2019). Evidence has shown that the mechanical instrumentation technique with files is limited because it tends to leave significant portions of the infected canal walls untouched; thus, a great number of viable pathogenic microorganisms persist, lodged together with dentin debris and necrotic pulp-tissue remnants inside the dentin tubules, canal ramifications, and resorption craters (Gondim *et al.*, 2012). The major reduction of bacteria in the root canals is achieved by the mechanical action of endodontic files and by irrigation. The need for medication increases in those cases where infection resists

regular treatments and the therapy cannot be successfully completed owing to the presence of pain or continuing exudation. Until the mid-1980s, there was a preference for using strong phenolic intracanal antiseptics such as formocresol, camphorated paramonochlorophenol (CPMC), cresatin etc. CMCP proved to be one of the most toxic and irritating phenolic antiseptic followed by cresatin, formocresol and camphorated phenol (CP)(Athanasias, Abbott and Walsh, 2007) (Masillamoni, Kettering and Torabinejad, 1981)Therefore, it is necessary to significantly reduce or to eradicate, to the extent possible, the microorganisms and their by-products present to the pulp canals by employing clinically effective and biocompatible irrigants, which also aid in dissolving organic debris (Ito, Junior and Paula-silva, 2011).

Irrigation currently represents the best method in paediatric pulpectomy for the lubrication and flushing away of loose necrotic and contaminated materials during instrumentation (Ito, Junior and Paula-silva, 2011; Kaur *et al.*, 2014). In clinical practice, different intracanal irrigants have been proposed for primary teeth, such as sodium hypochlorite (NaOCl), chlorhexidine gluconate, ethylenediaminetetraacetic acid (EDTA), citric acid and hydrogen peroxide (Kaur *et al.*, 2014), causing confusion among practitioners especially those who are less experienced. Thus, it is a challenge for dentists to choose the most appropriate irrigant agent when performing pulp canal treatments. Although several studies have tried to establish the effectiveness of diverse disinfecting substances, the irrigating solution that could be considered as the ideal agent irrigating agent has still not been found (Önçağ, Hoşgör and Hilmioğlu, 2003; Vasconcelos, Luna-Cruz and De-Deus, 2007; Tulsani, Chikkanarasaiah and Bethur, 2014). All of this is of utmost importance as it will influence the end product of obturation (Govindaraju, 2017a; Govindaraju, Jeevanandan and Subramanian, 2017a) as well as patient care (Nair *et al.*, 2018).

Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Ariga *et al.*, 2018; Basha, Ganapathy and Venugopalan, 2018; Hannah *et al.*, 2018; Hussainy *et al.*, 2018; Jeevanandan and Govindaraju, 2018b; Kannan and Venugopalan, 2018; Kumar and Antony, 2018; Manohar and Sharma, 2018; Menon *et al.*, 2018; Nandakumar and Nasim, 2018; Nandhini, Babu and Mohanraj, 2018; Ravinthar and Jayalakshmi, 2018; Seppan *et al.*, 2018; Teja, Ramesh and Priya, 2018; Duraisamy *et al.*, 2019; Gheena and Ezhilarasan, 2019; Hema Shree *et al.*, 2019; Rajakeerthi and Ms, 2019; Rajendran *et al.*, 2019; Sekar *et al.*, 2019; Sharma *et al.*, 2019; Siddique *et al.*, 2019; Janani, Palanivelu and Sandhya, 2020; Johnson *et al.*, 2020; Jose, Ajitha and Subbaiyan, 2020).

The aim of the present study was to evaluate the preference of root canal irrigants for pulpectomy of primary teeth in a university setting.

## MATERIALS AND METHODS

The present study involved a total of 2438 patients that underwent single visit pulpectomy procedures. The irrigants studied included saline, EDTA, Saline + EDTA, saline + sodium hypochlorite. The study was performed in a university setting at Saveetha Dental College and Hospitals. Thus the data obtained from the patients is of the same geographic location and ethnicity. The ethical approval for collection of retrospective data from the dental patient management archives was obtained from the Institutional Ethics Board. (IRB Approval No: SIHEC/2020/DIASDATA/0619-0320)The period of the study was between 1<sup>st</sup> June 2019 to 1<sup>st</sup> April 2020. Once the data was collected the same was verified by using photographs by two external reviewers who were blinded on the hypothesis from the present study. This was done to eliminate the chances of sampling bias. Before the commencement of the study a clear well defined inclusion criteria was defined. The inclusion criteria included that:

Patient has been treated by a resident of Saveetha Dental College, either an undergraduate or postgraduate student.

- Should have undergone single visit pulpectomy
- Should have been within the age group of 1-12 years. Patients were segregated into three age groups; Group 1- 1 - 4 years ; Group 2- 5 to 8 years; Group 3- 9-12 years.

Out of the study population that was chosen for the study there was no segregation process, as this would result in sampling bias. The data segregation was done according to various parameters such as speciality of clinic in which patient was treated, age of the patient, gender of the patient etc.

The data that was then tabulated was reviewed by an external reviewer and screened for internal validity of the study. The data was then exported to SPSS Software by IBM Version 20 for Statistical Analysis. Descriptive statistics was performed followed by Correlation tests to see any kind of correlation or Association between the different variables taken in the present study. Descriptive statistics and Chi square test was used to determine the correlation between the variables where P value < 0.05 is considered statistically significant with a confidence interval of 95%.

## RESULTS

Of the 2438 cases that underwent pulpectomy treatment and were included as part of the study, 1421 cases ( 58.3%) were males and 1017 cases were females (41.7%). The patients in the present study were within the age

group of 1-12 years with a mean age of  $4.8 \pm 1.7$  years. Majority of the patients were between the ages of 1-6 years (81.9%) and the remaining between 6-12 years (19.1%)

The teeth most frequently to have undergone pulpectomy were 84,85 (24.9%) followed by 74,75 (23.4%) . 2215 of the procedures were performed in the postgraduate clinic (90.9%), 200 (8.2%) in undergraduate clinics and 23 (0.9%) by specialists.

Out of the four irrigants in the present study the most commonly used was saline (59%) followed by saline with a combination of EDTA (32.5%), followed by EDTA alone (8.4%) and the least used irrigant was a combination of saline and sodium hypochlorite (0.1%). Saline was the most preferred irrigant in both the undergraduate and postgraduate clinics, and sodium hypochlorite was used only in the postgraduate clinics. A high correlation and association was noted between age of the patient and the type of irrigant used ( $p=0.002$ )

## DISCUSSION

In recent times, commonly used irrigation solutions include NaOCl, EDTA, citric acid, chlorhexidine (CHX), and electrochemical activation (ECA) of different solutions. However, the apparent toxicity of NaOCl and the effects of the chlorates ( $\text{ClO}_3^-$  and  $\text{ClO}_2^-$ ) should be recognized . In humans, these chemical substances are the products of oxidative damage to red blood cells, hemolytic anemia and methemoglobin formation and are also cytotoxic for fibroblasts.(Paudel *et al.*, 2011) These should be kept in mind before choosing an irrigant.

Currently, there is no agreement among paediatric dentists concerning the best irrigant solution for use against pulp pathogens involved in irreversibly inflamed/infected or non-vital primary teeth; this absence of consensus is probably due to the lack of evidence based research research to prove the superiority of any irrigants(Gondim *et al.*, 2012) agent . In their narrative review of intracanal (Kaur *et al.*, 2014) irrigants for primary teeth, Kaur et al. proposed six requirements that the ideal irrigant must possess: (1) broad antimicrobial spectrum, (2) high efficacy against anaerobic and facultative microorganisms organized in bio- films, (3) ability to dissolve necrotic pulp-tissue remnants, (4) ability to inactivate endotoxin, (5) ability to prevent the formation of or to dissolve the smear layer during instrumentation, and (6) a non-toxic (to periodontal tissues), non-caustic nature that does not cause an allergic reaction. Although there is a lack of consensus among various irrigants that have been included in the study, the most frequently used irrigant was saline. However saline does not satisfy most of the features that are included as part of the ideal criteria that is required for an ideal root canal irrigant. The advantage of saline is that it is non toxic to the periapical and periradicular tissues as reported by Turkun et al (Türkün, Gökay and Özdemir, 1998) and Yesilsoy et al (Yesilsoy *et al.*, 1995). It is evident from the study carried out by Yoshida et al (Yesilsoy *et al.*, 1995; Yoshida *et al.*, 1995) where antimicrobial activity of various irrigants were tested, saline has the least antimicrobial activity. Another factor that has to be considered is that the present study was carried out in a university setting where all participants were in a state of learning which could lead to a accidents using irrigants such as NaOCl (Mehdipour *et al.*, 2007)Thus, to prevent the same from occurring most students would have preferred saline and with time might progress to other irrigants. The preference for EDTA and combination of EDTA and saline as irrigants was seen to be higher with post graduate students. This could be due to the fact that most postgraduates would prefer rotary instruments compared to undergraduates.(Jeevanandan and Govindaraju, 2018a) Our institution is passionate about high quality evidence based research and has excelled in various fields ( Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

The limitations of the present study include that all irrigants available have not been included in the study, all the participants are students and practitioners can be involved to obtain a more concise knowledge and approach towards the same.

## CONCLUSION

Within the limits of the present study it is observed that the most common type of irrigant that is used is saline (59.03%) and the least commonly used is the combination of saline and hypochlorite(0.45%). Further studies are to be done to formulate a clear and distinct clinical practice guideline for pulpectomy procedure.Further awareness programmes that should be conducted to bring out better clinical outcomes and help the society holistically.

## AUTHOR CONTRIBUTIONS

Aniruddh Menon carried out the retrospective study, planning the study design, collection and analysis of data and drafted the manuscript. Nashra Kareem and Jayanth Kumar Vadivel aided in conception of the topic, supervision and appraisal of the manuscript.

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## CONFLICT OF INTEREST

No conflict of Interest.

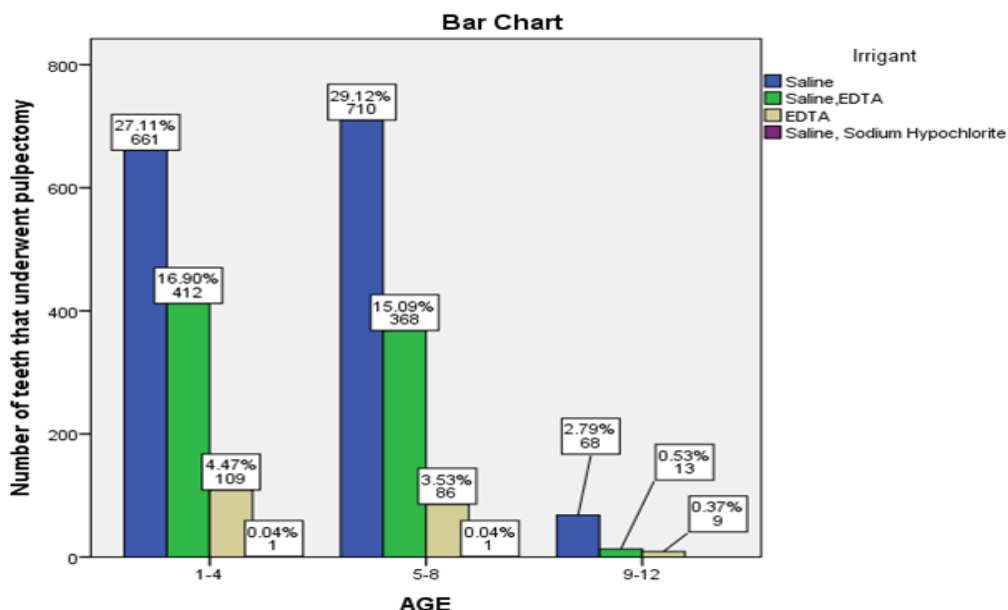
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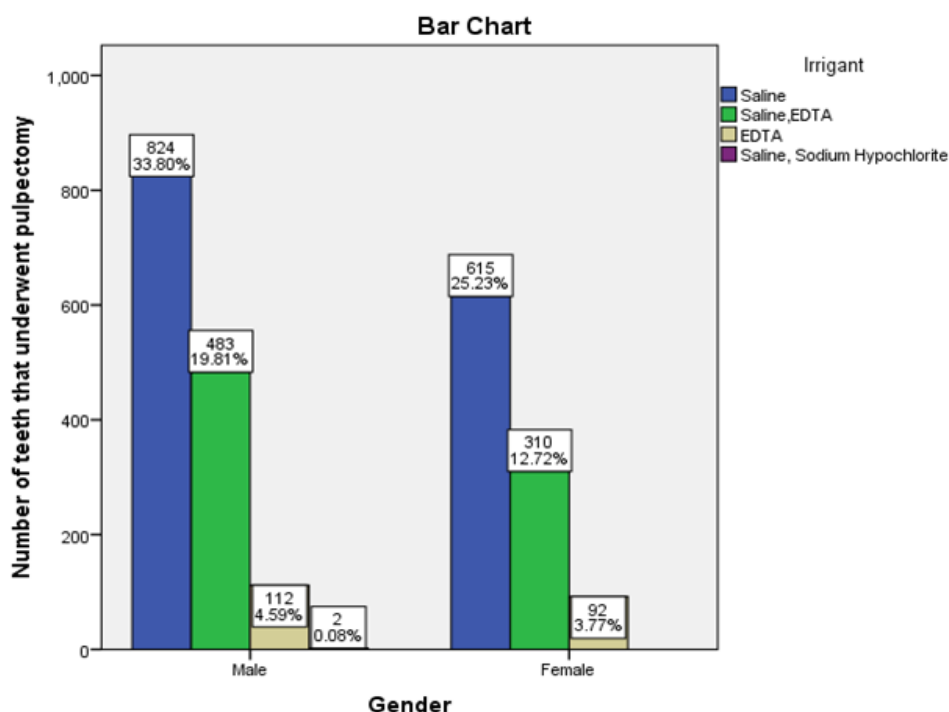
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**Graph 1:** Bar Graph shows association between the type of Irrigant that is used and the age of the patient. X axis represents age of patients and Y axis represents number of teeth that underwent pulpectomy. Most commonly used irrigant in all age groups is Saline. There is a statistical significant association (Chi Square Test, Value=20.898, df=6 and p=0.02) which infers that the usage of other irrigants other than saline decreases with age.



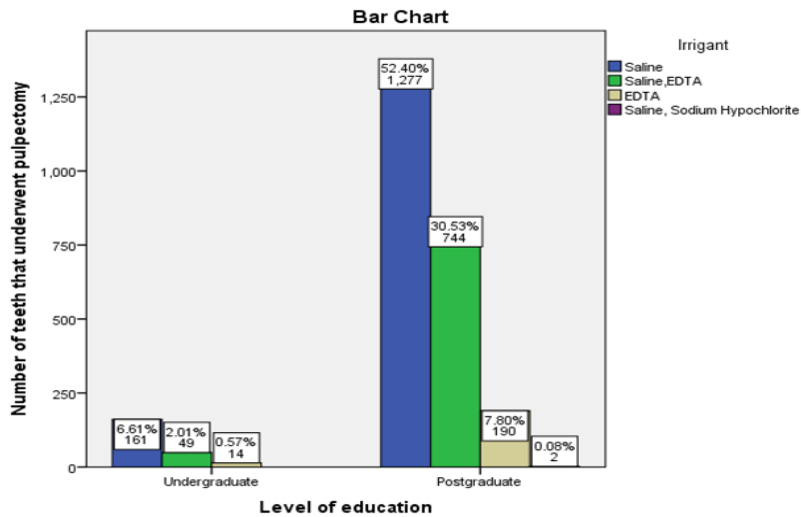
**Graph 2:** Bar Graph shows association between the irrigant that is used for pulpectomy and gender of the patient. X axis represents the gender of the patient and Y axis represents the number of teeth that underwent pulpectomy. Most commonly used irrigant among both the genders was saline (blue). However there was no statistically significant association between gender of patient and irrigant (Chi Square Test, Value= 5.255, df=3, p=0.154)

**Table 1**

		Irrigant				Total
		Saline	Saline,EDTA	EDTA	Saline, Sodium Hypochlorite	
Tooth Number	51	69	44	7	0	120
	52	76	48	14	0	138
	53	35	14	2	0	51
	54	107	66	19	0	192
	55	35	25	8	0	68
	61	66	47	11	0	124
	62	70	44	14	0	128
	63	34	18	6	0	58
	64	114	74	16	0	204
	65	55	31	9	0	95
	71	6	1	0	0	7
	72	9	1	2	0	12
	73	20	9	2	0	31
	74	167	84	25	2	278
	75	178	88	26	0	292
	81	6	2	0	0	8
	82	8	4	0	0	12
	83	19	12	1	0	32
	84	184	89	18	0	291
85	181	92	24	0	297	
Total (p= 0.002)		1439	793	204	2	2438

Table 1: Table shows association between the teeth number and the Irrigant which is used for pulpectomy. The most commonly used Irrigant is saline. Saline with EDTA and EDTA alone are used more commonly in molars than in anteriors. Saline along with hypochlorite is used only in the lower left molar. (Chi Square Test, Value= 92.578, df=57, p=0.002)





**Graph 3:** Bar Graph shows association between the level of education and the Irrigant that is used for pulpectomy. X axis represents the level of education and Y axis represents the number of teeth that underwent pulpectomy. The most commonly irrigant used in both levels of education was saline (blue). There is a statistically significant association (Chi Square Test, Value=17.073, df=3 and p=0.001) between the level of education and the Irrigant used for pulpectomy.