



Research Article

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## ***Using of MTAD and Sodium Hypochlorite in Irrigation of Necrotic Primary Teeth: A Systematic Review***

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### **ABSTRACT**

**Background:** Root canal irrigation of primary teeth is considered an integral part in pulpectomy and eradication of bacteria present in the infected root canal system. The complex morphology of the root canals of primary teeth which is formed of lateral canals and apical ramifications make mechanical instrumentation alone insufficient to debride the root canal and eliminate the bacteria. MTAD (Mixture of Tetracycline isomer, Acid and Detergent) and sodium hypochlorite are root canal irrigants that have strong antibacterial effect.(1). **Methods:** A comprehensive search was performed on PUBMED, Embase and Cochrane libraries. The primary outcome measure that was assessed was resolution of clinical symptoms (including pain, swelling, and fistula) after irrigation of the necrotic primary teeth with MTAD or sodium hypochlorite. The secondary outcome was the antibacterial effect of the used irrigants that was evaluated by measuring the reduction in the intracanal bacterial count after irrigation. **Results:** Two articles of randomized clinical trials met the inclusion criteria and were included. Insufficient information was provided regarding resolution of clinical symptoms (including pain, swelling, and fistula) after irrigation of the necrotic primary teeth. However studies reported feasible reduction of intracanal bacterial loading of necrotic primary teeth after irrigation using MTAD when compared to sodium hypochlorite.

**Keywords:** Pulpectomy, MTAD, Sodium hypochlorite.

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### **INTRODUCTION**

Increasing the clinical success rate of pulpectomy in primary teeth is strongly depending on eradication of bacteria present in the root canals. The complex morphology of root canals of primary teeth make mechanical instrumentation unable to perform adequate disinfection of the root canal system (2).

Therefore, it is necessary to use an effective irrigant which has strong antibacterial effect and at the same time biocompatible to increase the success rate of pulpectomy (3).

Sodium hypochlorite is one of the most commonly used irrigating solutions that are famous for its antibacterial effect (4), while MTAD (Mixture of Tetracycline isomer, Acid and Detergent) is one of the recently introduced irrigating solution which has strong antibacterial effect attributed largely to doxycycline, which is the main component that is included to inhibit bacteria. (5).:

The aim of the current systematic review to assess the clinical efficacy, and antibacterial efficacy of MTAD and Sodium hypochlorite intracanal irrigants used during pulpectomy of necrotic primary teeth

**Objective:**

To conduct a systematic review to assess the clinical efficacy of MTAD and Sodium hypochlorite intracanal irrigants used during pulpectomy of primary teeth in resolution of pain and clinical symptoms and reduction of intracanal bacterial count.

**PICO**

P: Children with necrotic primary teeth indicated for pulpectomy

I: MTAD irrigation

C: Sodium Hypochlorite

O: Pain assessment

Reduction in intracanal bacterial count

**METHODS**

The systematic review was undertaken in line with the recommendations of the guidelines of the Cochrane Handbook for Systematic Reviews of Interventions(6).

**Funding**

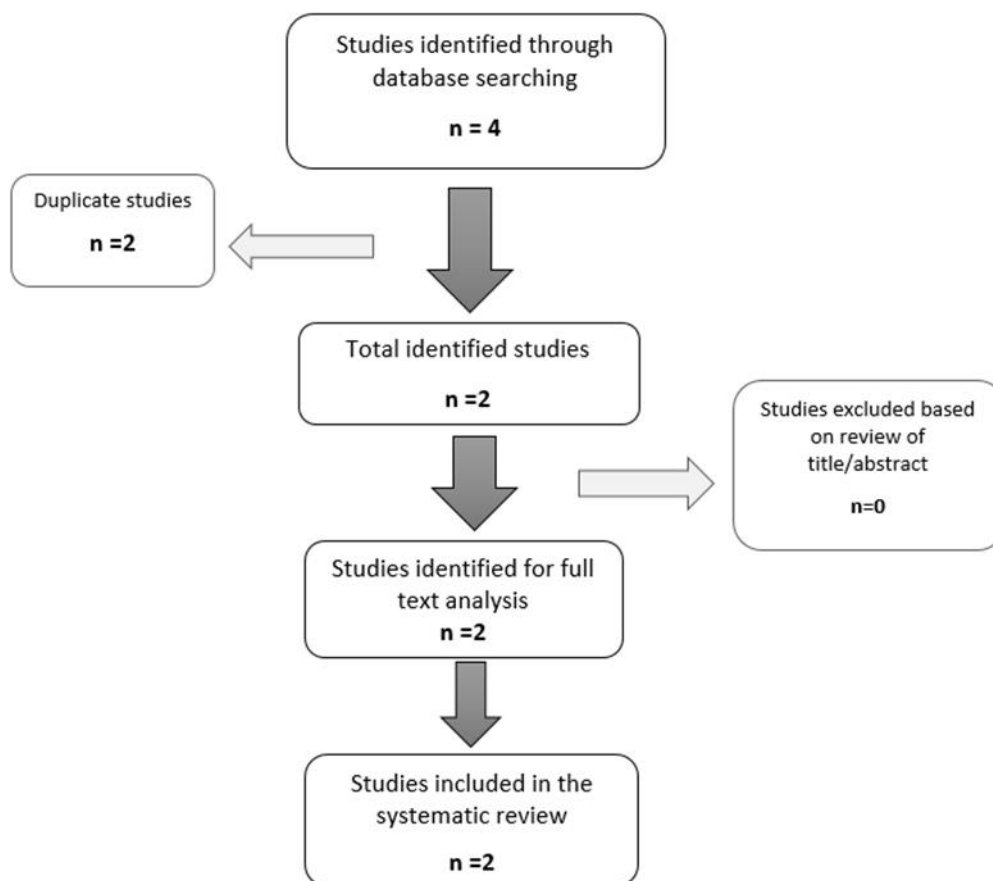
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**The review question]**

In children with necrotic primary teeth indicated for pulpectomy, Does MTAD or Sodium hypochlorite irrigation of the necrotic root canals of primary teeth, will show clinical efficacy in resolution of pain and clinical symptoms and reduction of intracanal bacterial count?

**Search strategy**

Three databases were searched in an attempt to locate any and all existing articles on irrigation of root canals of primary teeth using MTAD and sodium Hypochlorite (PUBMED, EMBASE, Cochrane libraries). Structured electronic search was carried out using combinations of the following search terms: 'Deciduous teeth', 'Primary teeth', 'Milk teeth', 'Pulpectomy', 'non vital', 'necrotic', 'MTAD', 'Biopure MTAD', 'Root Canal Irrigants', 'Sodium Hypochlorite' and 'NaOCl'. The MeSH term "Pulpectomy", "MTAD", "Sodium Hypochlorite" were found in PUBMED and were used in searching for the comprehensive search strategy. Screening the reference lists of relevant articles and citation searching were also employed. Results of the search strategy after searching through Pubmed, EMBASE and Cochrane data bases, were demonstrated in figure (1). The search was last updated on 31 December 2016. Articles in the English language were only included.



**Figure 1.** Flow diagram for the search results

**Inclusion and exclusion criteria:**

Selection of the studies was basically done according to the PICO elements; details of the inclusion and exclusion criteria in table 1.

**Table (1): Inclusion and exclusion criteria**

Inclusion Criteria	Exclusion criteria
1- (P): Children age 3-8 years with necrotic primary tooth indicated for pulpectomy	1. In-vitro studies
2- (I): MTAD irrigating solution	2. Studies performed on permanent teeth
3- (C): sodium hypochlorite irrigating solution	3. Non-English studies.
4- (O): studies with identified outcome(s)	
5- (S): Randomized clinical trials (RCT)	
6- Studies from 1990 to 2016	

**Data Extraction:**

Data which met the stated inclusion were read in full text then data was extracted by two independent reviewers. Two articles of Randomized Clinical Trials met the inclusion criteria and were included in the current systematic review. Information extracted from each article included the author, year of publication, country of performing the study, aim of the study, ethical issues, recruitment context, patient range of age, problem to be addressed, study design, sampling,

type of irrigating solution used, follow up duration and intervals, outcomes, conclusion and recommendations. Disagreement between the two reviewers was resolved through discussion.

The primary outcome measure was the resolution of clinical symptoms (including pain, swelling, and fistula). The secondary outcome measure was the effect on the bacterial count in the infected root canal of primary teeth.

### Quality assessment

The design and quality of each of the included studies was assessed, including whether a focused research question has been addressed, relevant key words have been used and also regarding the clarity and validity of the outcomes and results. (Table 2)

**Table (2): Quality Assessment table**

	Did the study include keywords that identify areas covered in the study?	Did the study address a clearly focused question?	Are the aims and purpose of the study clearly stated?	Are the details of the technique sufficiently given to allow its transferability to other clinical settings?	Are the outcomes of the studies clearly stated?	Are the outcomes measured using a defined method?	Are the methods of collecting data clearly described?	Is the case clearly described?	Are the results credible and relevant for practice?	Are the conclusions drawn justified by the results?	Quality assessment score
Tulsani et al.(7)	Yes	Yes	Yes	yes	yes	yes	yes	Yes	Yes	No	9/10
Farhin et al., (8)	Yes	Yes	yes	No	yes	No	No	Yes	Yes	Yes	7/10

## RESULTS

Two studies were identified through the search, which are **Tulsani et al., (7)** and **Farhin et al. (8)**.

They were potentially eligible for full text analysis (figure 1); the 2 studies were included in the systematic review.

Characteristics of the included studies were represented in table 3 while table 4 is showing interpretation of the methodological steps performed in each study.

**Table (3): Characteristics of studies included in the systematic review**

	<b>Tulsani et al.,(7)</b>	<b>Farhin et al. (8)</b>
Citation	Tulsani SG, Chikkanarasaiiah N and Bethur S. <sup>7</sup> An in vivo comparison of antimicrobial efficacy of sodium hypochlorite and Biopure MTAD against enterococcus faecalis in primary teeth. J ClinPediatr Dent, 39(1), 30-34, (2014) <sup>7</sup>	Farhin K, Viral PM, Thejokrishna P and Sajjad M. Reduction in Bacterial Loading Using MTAD as an Irrigant in Pulpectomized Primary Teeth. J ClinPediatr Dent, 39(2), 100-104, (2015) <sup>8</sup>
Country	India	India
Aims: (explicit / Implicit/ not mentioned)	Explicit	Explicit
Aims	To compare the in vivo antimicrobial efficacy of NaOCl 2.5% and Biopure MTAD against E. faecalis in primary teeth.	To evaluate the reduction in bacterial loading using MTAD as an irrigating solution in pulpectomized primary teeth
Ethics- how ethical issues were addressed	The purpose of the study was explained to the parent of each child and a written informed consent was obtained before inclusion in the study.	By obtaining a written consent from their respective parents/ guardians.
Recruitment context (e.g. where people were recruited from)	Department of Pedodontics and Preventive Dentistry, Rajarajeswari Dental College and Hospital, Bangalore, India	Department of Pedodontics and Preventive Dentistry, Terna Dental College, Navi Mumbai, India.
Problems to be addressed	Anaerobes, especially Enterococcus faecalis, are responsible for development of pulp pathosis, periradicular inflammation,	Presence of bacteria and their byproducts within the root canals of primary teeth

	involving signs and symptoms such as pain, swelling, tenderness and exudation.	minimize the chances of a successful pulpectomy.
Study design	RCT	RCT

**Table (4): Methodological table**

Sampling:		
a- Number of canals treated	40 canals	60 canals
b- Number of patients	40 patients	not mentioned
c- Randomization (Y/N)	Yes	No
d- Method of randomization	Using list of random numbers generated from computers	Not mentioned
e- Age of the patients	4-8 years	3-7 years
Type of the irrigating solutions used	Group (1) : 2.5% NaOCl Group (2) : MTAD Group (3) : Saline	Group (1) : MTAD Group (2) : 1% NaOCl
Amount of irrigating solutions used in ml	5 ml	Not mentioned
Irrigated tooth ( anterior / molar)	Anterior	molars
Gauge of needle used in irrigation	In group (1): 24 G In group (2): 28 G	Not mentioned
Root canal filling material	Zinc oxide and eugenol paste	Iodoform paste (vitapex)
Type of final restoration (crown/amalgam/ composite/ glass ionomer)	Not mentioned	Not mentioned
Follow up		
a- Duration of follow up		
b- Follow up intervals		
c- Clinical evaluation (Y/N)		
d- Radiographic evaluation		
Type of radiographic tech. used in follow up		
Outcome:		
1-outcome of the research (Implicit/Explicit/Not clear)	Implicit	Implicit
2- Measured outcomes	Reduction in Enterococcus Faecalis following irrigation of the root canals	Reduction in the bacterial count following irrigation
3-Did the study include assessment of Pain following irrigation and pulpectomy?	No	No
4-Did the study include assessment of the bacterial count before and after irrigation of the root canals?	Yes	Yes
5- Did the study include clinical follow up for the treated teeth?	No	No
6- Did the study include radiographic follow up for the treated teeth?	No	No
Conclusions included? Yes/No	Yes	Yes
If Yes, mention	NaOCl 2.5% and BioPure MTAD, both irrigants are equally efficient against E. faecalis in necrotic primary anterior teeth.	MTAD is a feasible alternative for irrigation after pulpectomy of necrotic primary teeth.
Recommendations included? (Yes/No) If yes, mention	No	No

### Primary outcome measure

No specific data were collected regarding resolution of clinical symptoms (including pain, swelling, and fistula) after irrigation of the necrotic primary teeth, due to lack of follow up for the patients.

### Secondary outcome measure

The included studies reported feasible reduction of intracanal bacterial loading of necrotic primary teeth after irrigation using MTAD when compared to sodium hypochlorite.

### Interpretation

It was found that the clinical evaluation of the treated tooth hasn't been investigated in the available studies, and there was no clinical or radiographic follow up for the treated cases. The included studies have investigated the antibacterial effect of the MTAD and sodium hypochlorite against the bacteria present in the root canals of necrotic primary teeth.

Regarding the quality of the investigated studies, (Table 2), the quality assessment scores ranged from 7 to 9 out of 10 for all studies, suggesting being of moderate to high quality.

Regarding the methodology of the studies, a series of questions have been asked regarding the clinical procedures performed during irrigation and collection of the bacterial sample (Table 4), however, One of the studies (8Farhin et al., 2015) didn't provide sufficient explanation of the technique used to allow its transferability to other clinical settings. For example, the total amount of the irrigating solution used for irrigation of the root canals wasn't clear. The gauge of the needle used during irrigation wasn't mentioned, which affects the penetration of the needle into the root canal, and intern affects the eradication of bacteria.]

The included randomized clinical trials concluded that MTAD proved to be an efficient root canal irrigant that has strong antibacterial effect and it is able to eradicate root canal bacteria with efficiency better than Sodium Hypochlorite. However further Randomized Clinical Trials are required with clinical follow up for the patients to investigate the effect of these irrigants on the resolution of pain and other clinical symptoms.

## CONCLUSIONS

Based on that systematic review, it can be concluded that:

There is evidence that MTAD has strong antibacterial effect against intracanal bacteria in necrotic primary teeth.

There are no available studies evaluating the effect of MTAD or sodium hypochlorite irrigation on the resolution of clinical manifestations of necrotic primary teeth (such as pain, swelling, sinus tract).

There is no long term studies evaluating the clinical success of pulpectomy using MTAD or sodium hypochlorite in irrigation of necrotic primary teeth.

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