

# IRRIGATION PROTOCOL AMONG PALESTINIAN GENERAL DENTAL PRACTITIONERS

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## ABSTRACT:

**Background:** The success of an endodontic treatment depends upon how efficiently the microbes are eradicated from the root canal. Irrigation is vital for flushing out the pulp remnants and debris from the root canal.

**Aim:** To determine the irrigation protocol among Palestinian general dental practitioners.

**Materials and Methods:** An online questionnaire was sent to three hundred dentists registered in Palestinian dental association. This questionnaire consisted of nineteen questions related to the irrigant used in root canal treatment.

**Results:** 185 dentists responded with a response rate of 61.7%. Hydrogen peroxide solution was found to be the most preferred irrigant with a rate of 58.4%. Sodium hypochlorite was the chosen by 29.2% respondents. 27.6% participants used 2-3% solution of sodium hypochlorite. 50.1% participants used 2ml solution of sodium hypochlorite for irrigation.

**Conclusions:** From this study it can be concluded that although there is no consensus among the Palestinian general dentists about irrigant volume or concentration, but still hydrogen peroxide is the most preferred irrigant among the Palestinian dentists.

**Keywords:** Irrigation in RCT, Root canal irrigant, sodium hypochlorite, normal saline, hydrogen peroxide

## INTRODUCTION:

Root canal treatment primarily aims at removing the infected pulp from the root canals of the affected teeth. Its success depends upon the efficiency with which it removes the microbes or microorganisms from the canal.

Despite the advent of numerous modern techniques and instruments in canal shaping, more than 35% of the root canal's surface can be left uninstrumented after non-surgical root canal treatment.<sup>[1]</sup> Also, in case of treated canals the debris are, sometimes, left behind because of inadequate irrigation.

Several investigators have also shown that unless adequate irrigation is a part of cleaning process, debris will be left behind irrespective of irrigant used.<sup>[2]</sup> Moreover, the cleaning efficiency of the irrigant depends only upon the volume used. Some research have also shown that frequent irrigation of the canal is important during the root canal procedure.<sup>[3]</sup>

According to Zehnder<sup>[4]</sup> an ideal irrigant must be non toxic to the body tissues, non irritant to the surrounding periodontal tissue, must have a broad spectrum of antimicrobial activity, dissolve the smear layer and should inactivate the toxins released by microbes.

Over several years, different irrigation solutions have been recommended. These include use of a stream of hot water through an insulated syringe,<sup>[5]</sup> saline solution,<sup>[2]</sup> use of a solution of chloramine,<sup>[6]</sup> use of urea,<sup>[7]</sup> sodium hypochlorite and a solution of sodium hypochlorite with EDTA. Out of the above, a 5.2% solution of sodium hypochlorite has been found most effective.<sup>[8]</sup>

**Sodium hypochlorite solution:** Sodium hypochlorite is a reducing agent. It is clear straw colored solution with 5% of the available chlorine. The solution is usually kept in a cool place away from sunlight.

Sodium hypochlorite (NaOCl) has been able to meet most of the criteria of ideal irrigant. It has a broad antibacterial spectrum while also possessing some ability to inactivate endotoxins.<sup>[9,10,11]</sup>

The solvent action of sodium hypochlorite has been confirmed.<sup>[12]</sup> It can dissolve the entire pulp in 20 minutes to two hours. In spite of its toxicity, unpleasant taste, and inability to completely remove the smear layer, sodium hypochlorite remains the most recommended irrigant.<sup>[13]</sup> But no unanimity of opinions exists among researchers about the concentration to be used. According to some surveys, 2.6-5.2% solution is found to be most effective.<sup>[14,15]</sup>

**Hydrogen peroxide:** Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) has an oxidizing effect. Sometimes it is used as an adjunct to sodium hypochlorite. But no significant difference is seen in cleanliness of the canal irrigated

with hydrogen peroxide and that irrigated with NaOCl.

Alternating use of hydrogen peroxide and sodium hypochlorite is sometimes advocated. It produces effervescence that flushes out the debris of the canal. However, the combination with hydrogen peroxide seems to reduce tissue solvent property of sodium hypochlorite.<sup>[16]</sup>

**EDTA:** It is a chelating agent that can be used as an irrigant. This solution removes the smear layer off the dentin and thus helps in removal of the debris.<sup>[17,18]</sup> Some clinicians even advocate the use of EDTA followed by NaOCl.<sup>[19]</sup>

In this study, the comparative use of various irrigant solutions have been illustrated. This study also takes into account the volume of irrigant used and the technique used in irrigation. This study is done to check briefly the established irrigation procedure among Palestinian endodontists.

## **MATERIALS AND METHODS:**

This study was carried out among 300 registered Palestinian dentists. These were randomly selected. The sampling frame consisted of 1000 general dental practitioners (GDPs) registered in Palestinian dental association.

An online self-administered questionnaire was e-mailed to the selected endodontists. It consisted of 18 questions regarding the gender, years of experience, the irrigant used, the concentration of irrigant used, its volume, reason of using the irrigant and the technique used. The

general questions such as gender and years of experience are given in table 1. Rest questions are illustrated separately in tables 2,3 and 4.

The personal information of the dental practitioners such as name was not sought to keep the anonymity of the participants. Contingency tables were used to evaluate the data.

The study received the needed ethical approval from Al Quds University Research and Ethics Committee under the number 9/REC/18. It was an exempt from ethical approval as no human was used for the study.

## RESULTS:

Out of 300 randomly selected dentists, 185 responded with a rate of 61.7%. Almost equal number of males and females participated in the study with 52.9% and 47.1% respectively. Out of these, 47.6% were having an experience of 0-5 years, 16.8% had a working experience of 6-9 years, 18.9% had experience of 10-15years while the rest 16.8% were having experience of more than 15 years. (Table 1)

**Irrigant used (Table 2):** When the participants were asked about the irrigants they usually use during endodontic procedure 58.4% GDPs chose hydrogen peroxide as the irrigant of their choice while 29.2% chose sodium hypochlorite. Chlorhexidine, local anesthesia and normal saline were also chosen by 1.1%, 3.8% and 7.6% of GDPs respectively.

**Irrigant concentration and volume of the irrigant used (Table 3,4,5):** Those who use NaOCl in their regular root canal treatment have different consensus over the concentration of Sodium hypochlorite used. Majority of them used 2-3% of NaOCl with a percentage of 27.6%. Nearly equal number of dentists used 3-4% of Sodium hypochlorite solution with a significant number of 50/185 (27.0%). 13.5% and 8.1% of GDPs used 1-2% and 0.5% NaOCl solutions respectively. Rest 8.1% used sodium hypochlorite solution of more than 5% concentration.

When the participant dentists were asked about the volume of irrigant they use, majority of them go for 2ml of the irrigant solution with a percentage of 50.3%. 50/185 (27.0%) of GDPs used 5ml of the solution while 16/185(8.7%) preferred using 10ml of solution. Only 3.8% participants choose 0.5ml of solution while rest 10.3% used more than 10ml irrigant solution in their root canal procedure.

On asking about the reason to choose the preferred irrigant, various reasons such as antibacterial property, biocompatibility and tissue dissolving characteristics were taken into account with 69.7%, 13.6% and 16.8% respectively. 135/185 (73.0%) GDPs do not think that price of the irrigant matters much whereas 21/185 (11.4%) of participants believed biocompatibility to be the least of the issues. 9.2% of dentists took anti bacterial property as least of the concerns and only 12/185 (6.5%) of the dentists think that tissue solubility does not deserve much concern.

**Removal of the smear layer (Table 6):**

During this study it is found that 51/185 (27.0%) GDPs believed that there is no need of removal of smear layer while 134/185 (72.9%) participant dentists believed that it is mandatory to remove smear layer with the help of irrigants.

**Choice of irrigant according to pulpal and periapical diagnosis (Table 6):**

The participants were asked whether their choice of irrigant depends upon pulpal and periapical pathology. In response to this, 125/185 (67.6%) gave a positive answer while rest 60/185 (32.4%) said no.

Also the dentists were asked that while treating a tooth with vital pulp, which irrigant they would mainly use. In response to this, 105/185 (56.8%) of participants suggested NaOCl. Other options such as hydrogen peroxide and normal saline were also suggested with rate of 21.1% and 22.2% respectively.

While choosing irrigant for tooth with periapical pathology, majority of participants chose sodium hypochlorite solution (67.6%) while others preferred hydrogen peroxide (16.2%), chlorhexidine (7.6%), normal saline (7.0%), Iodine (1.1%) and citric acid (0.5%).

Sodium hypochlorite solution was irrigant of choice in retreatment cases also with frequency of 74.1%. 14.6% chose hydrogen peroxide, 5.4% chose chlorhexidine while 5.9% chose normal saline.

**Choice of irrigant in retreatment cases (Table 7):**

In retreatment cases, 74.1%

respondents stick to sodium hypochlorite while 14.6% participants used hydrogen peroxide. Normal saline and chlorhexidine was suggested by 5.95% and 5.4% respondents respectively.

**Adjuncts to Irrigation (Table 7):** On asking about the adjuncts to the irrigation, 80.6% suggested none, 7.0% suggested ultrasonic cleaning, 1.6% suggested Subsonic activation endo activator, 1.6% agreed to Negative pressure – endovac, 1.6% were with heating of NaOCl, 3.2% agreed on heating while 5.9% suggested Gutta percha / File.

**Irrigation technique (Table 8,9):**

The participants were asked about the gauge of needle they use while irrigation. 24.3% suggested a needle of 26 gauge, 29.7% preferred 27 gauge needle, 12.9% like to use 30 gauge needle, 1.1% preferred 31 gauge needle while 31.9% participants were not sure.

When the respondents were asked if they use side vented needles, 18/185 (9.7%) gave positive response while rest 90.3% participant GDPs said no.

On asking about the depth of insertion of the needle during irrigation, 31.9% GDPs answered in the middle of the canal, 47.6% answered at orifice level or slightly below. 19.5% participants suggested insertion of the needle up to 3mm before the apex.

The participant GDPs were also asked about the final wash they use before obturation. Normal saline was the choice solution of 51.2% participant GDPs. 32.4%

recommended sodium hypochlorite, 6.5% chose H<sub>2</sub>O<sub>2</sub>, 4.9% chose EDTA while 1.1% chose citric acid solution for final wash. 2.2% and 1.6% participant GDPs chose Chlorhexidine and distilled water respectively.

On asking about the fact that the practitioners leave sodium hypochlorite in the canals in between the appointments, 76.2% GDPs said no while only 9.7% said yes. Rest 14.1% said that they leave the solution inside the canals sometimes.

### DISCUSSION:

The aim of root canal treatment is to clean root canal by considering biological, chemical and mechanical objectives. Irrigation plays a vital role in removing the microbes and debris from the canals. It has several important functions, which may vary according to the irrigant used: it reduces friction between the instrument and dentine, improves the cutting effectiveness of the files, dissolves tissue, cools the file and tooth, and furthermore, it has a washing effect and an antimicrobial/antibiofilm effect. [20]

There is no single irrigating solution that alone sufficiently covers all of the functions required from an irrigant. Optimal irrigation is based on the combined use of 2 or several irrigating solutions, in a specific sequence, to predictably obtain the goals of safe and effective irrigation.

In a survey conducted in North Jordan, it was found that only 32.9% of general dentist respondents used sodium hypochlorite and 33.6% used hydrogen

peroxide during root canal treatment. [21] In this study, it was found that 29.2% of Palestinian GDPs preferred Sodium hypochlorite solution while 58.4% respondents used hydrogen peroxide in the root canal treatment.

In this study it is found that sodium hypochlorite is also the irrigant of choice in retreatment cases for 56.8% participants. Although 67.6% of respondents in this study stated that their choice of irrigant might change on the basis of pulpal and periapical diagnosis, their primary irrigant was still overwhelmingly sodium hypochlorite.

When asked about adjuncts used for irrigation, participants were given choices including ultrasonic activation, sonic activation, subsonic activation, and negative pressure. In this study 80.4% opted for the option none.

A previous survey among members of the American Association of Endodontists in 2001 revealed that 51% of practicing endodontists removed the smear layer before obturation of the root canal system. [22] This differs from the results of our study that indicate 72.4% of endodontists routinely aim to remove the smear layer.

In this study it was found that normal saline is the most recommended solution for the final wash before obturation with a relatively high frequency of 51.4%.

For a detailed analysis of the various irrigant agitation techniques and devices,

the reader is referred to the review by Gu et al of the topic. [23]

## CONCLUSION:

From this study it can be concluded that hydrogen peroxide is the irrigant of choice in most of the root canal treatments while Sodium hypochlorite is the choice of irrigant in retreatment cases. Most of the respondents are using 2ml of 2-3%

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**TABLES:**

**Table 1: General Criteria**

Parameters	Number of participants (%age)
<b>Gender</b>	
Male	98 (52.9%)
Females	87 (47.1%)
<b>Years of experience</b>	
0-5 years	88 (47.6%)
6-9 years	31 (16.8%)
10-15 years	35 (18.9%)
>15 years	31 (16.8%)

**Table 2: Irrigants used in RCT**

	Females	Males	Total	
<b>Which irrigants do you use?</b>	H2O2	56 (65.1%)	52(52.5%)	108 (58.4%)
	Sodium hypochlorite	25 (29.1%)	29 (29.3%)	54 (29.2%)
	Normal saline	2 (2.3%)	12 (12.1%)	14 (7.6%)
	Chlorhexidine	1 (1.2%)	1 (1.0%)	2 (1.1%)
	Local anesthesia	2 (2.3%)	5 (5.1%)	7 (3.8%)

**Table 3: Concentration of sodium hypochlorite used as irrigant**

		Females	Males	Total
<b>Which concentration of sodium hypochlorite do you use?</b>	0.5%	10 (11.6%)	5 (5.1%)	15 (8.1%)
	1-2%	3 (3.5%)	22 (22.2%)	25 (13.5%)
	2-3%	21 (24.4%)	30 (30.3%)	51 (27.6%)
	3-4%	26 (30.2%)	24 (24.2%)	50 (27.0%)
	4-5%	1 (1.2%)	9 (9.1%)	10 (5.4%)
	More than 5%	14 (16.3%)	1 (1.0%)	15 (8.1%)
	I do not use sodium hypochlorite	11 (12.8%)	8 (8.1%)	19 (10.3%)

**Table 4: Volume of irrigant used**

		Female	Male	Total
<b>What is the volume of irrigation do you use per canal?</b>	0.5 ml	2 (2.3%)	5 (5.1%)	7 (3.8%)
	2 ml	44 (51.2%)	49 (49.5%)	93 (50.3%)
	5 ml	17 (19.8%)	33 (33.3%)	50 (27.0%)
	10 ml	13 (15.1%)	3 (3.0%)	16 (8.7%)
	More than 10 ml	10 (11.6%)	9 (9.1%)	19 (10.3%)

**Table 5: Choice of the irrigant**

		Female	Male	Total
<b>The most important reason for choosing the irrigant</b>	Antibacterial property	73 (84.9%)	56 (56.6%)	129 (69.7%)
	Biocompatibility	5 (5.8%)	20 (20.2%)	25 (13.5%)
	Tissue dissolving	8 (9.3%)	23 (23.2%)	31 (16.8%)
<b>The least important reason for choosing irrigant</b>	Antibacterial property	7 (8.1%)	10 (10.1%)	17 (9.2%)
	Biocompatibility	14 (16.3%)	7 (7.1%)	21 (11.4%)
	Tissue dissolving	5 (5.8%)	7 (7.1%)	12 (6.5%)
	Price	60 (69.8%)	75 (75.8%)	135 (72.9%)

Table 6: removal of smear layer, choice of irrigant depending upon pupal and periapical pathology, choice of irrigant while treating a tooth with vital pulp

		Female	Male	Total
<b>Do you routinely remove smear layer?</b>	Yes	30 (34.9%)	20 (20.2%)	50 (27.0%)
	No	56 (65.1%)	79 (79.8%)	135 (72.9%)
<b>Does your choice of irrigant depend upon periapical or pulpal pathology?</b>	Yes	60 (69.8%)	65 (65.7%)	125 (67.6%)
	No	26 (30.2%)	34 (34.3%)	60 (32.4%)
<b>When treating a tooth with a vital pulp, which irrigant do you mainly use?</b>	H2O2	14 (16.3%)	25 (25.3%)	39 (21.1%)
	Sodium hypochlorite	60 (69.8%)	45 (45.5%)	105 (56.8%)
	Normal saline	12 (13.9%)	29 (29.3%)	41 (22.2%)
<b>While treating a tooth with a periapical lesion, which irrigant do you mainly use?</b>	H2O2	13 (15.1%)	17 (17.2%)	30 (16.25)
	Sodium hypochlorite	57 (66.3%)	68 (68.7%)	125 (67.6%)
	Normal saline	6 (6.9%)	7 (7.1%)	13 (7.0%)
	Citric acid	1 (1.2%)	0 (0.0%)	1 (0.5%)
	Iodine	1 (1.2%)	1 (1.0%)	2 (1.1%)
	Chlorhexidine	8 (9.3%)	6 (6.1%)	14 (7.6%)

Table 7: irrigants in retreatment cases, adjuncts to irrigation

		Female	Male	Total
In retreatment cases, which irrigant would you mainly use?	Chlorhexidine	5 (5.8%)	5 (5.1%)	10 (5.4%)
	H2O2	11 (12.8%)	16 (16.2%)	27 (14.6%)
	Normal saline	5 (5.8%)	6 (6.1%)	11 (5.9%)
	Sodium hypochlorite	65 (75.6%)	72 (72.7%)	137 (74.1%)
Do you use any adjuncts to the irrigation?	Gutta percha	6 (6.9%)	5 (5.1%)	11 (5.9%)
	Heating	4 (4.7%)	2 (2.0%)	6 (3.2%)
	Negative pressure	0 (0.0%)	3 (3.0%)	3 (1.6%)
	None	72 (83.7%)	77 (77.8%)	149 (80.5%)
	Subsonic activation	1 (1.2%)	2 (2.0%)	3 (1.6%)
	Ultrasonic activation	3 (3.5%)	10 (10.1%)	13 (7.0%)

Table 8: Needle used in irrigation

		Female	Male	Total
What is routine gauge of needle you use for irrigation?	26 gauge	22 (25.6%)	23 (23.2%)	45 (24.3%)
	27 gauge	25 (29.1%)	30 (30.3%)	55 (29.7%)
	30 gauge	12 (13.9%)	12 (12.1%)	24 (12.9%)
	31 gauge	2 (2.3%)	0 (0.0%)	2 (1.1%)
	I do not know	25 (29.1%)	34 (34.3%)	59 (31.9%)
Do you use side vented needles?	Yes	8 (9.3%)	10 (10.1%)	18 (9.7%)
	No	78 (90.7%)	89 (89.9%)	167 (90.3%)
How deep do you insert needle for irrigation?	1mm before the apex	0 (0.0%)	2 (2.0%)	2 (1.1%)
	3mm before the apex	19 (22.1%)	17 (17.2%)	36 (19.5%)
	At orifice level or slightly below	45 (52.3%)	43 (43.4%)	88 (47.6%)
	In the middle of the canal	22 (25.6%)	37 (37.4%)	59 (31.9%)

Table 9: Final wash before obturation

		Female	Male	Total
<b>What is the final wash that you use before obturation?</b>	Chlorhexidine	0 (0.0%)	4 (4.0%)	4 (2.2%)
	H2O2	6 (6.9%)	6 (6.1%)	12 (6.5%)
	Normal saline	40 (46.5%)	55 (55.6%)	95 (51.4%)
	Sodium hypochlorite	34 (39.5%)	26 (26.3%)	60 (32.4%)
	Citric acid	2 (2.3%)	0 (0.0%)	2 (1.1%)
	Distilled water	3 (3.5%)	0 (0.0%)	3 (1.6%)
	EDTA	1 (1.2%)	8 (8.1%)	9 (4.9%)
<b>Do you leave sodium hypochlorite inside the canals between appointments?</b>	Yes	11 (12.8%)	8 (8.1%)	19 (10.3%)
	Sometimes	7 (8.1%)	10 (10.1%)	17 (9.2%)
	No	68 (79.1%)	81 (81.8%)	149 (80.5%)