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# A Survey of Endodontic Irrigants Used by Dentists With Varying Years of Professional Experience

SUMMARY

***Background/Aim:*** *The aim of the present study was to describe the use of irrigants by dentists in Bulgaria in relation to their years of professional experience.* ***Material and Methods****: The data were collected with the help of a questionnaire. The survey included questions concerning frequency of irrigants applied, their respective concentrations, as well as spectrum of disinfectants used in endodontics. In addition, information about respondents' age, years of professional experience, gender, and main areas of continuing education was collected. The statistical analysis was performed with the help of IBM SPSS Statistics 22.0.* ***Results:*** *219 replies were analysed (response rate 27,3%). The majority of the respondents (31.1%) had 21 to 30 years of professional experience. 18.7% had over 30 years. Most of the practitioners reported their continuing education to be in the area of general dentistry – 52%, while about 1.2 % had specialised in endodontics. Dentists with long-standing professional experience use predominantly* $H_2O_2$ *– 78%. Dentists with least experience use 17% EDTA – 53.6%. No significant* differences were established for the use of sodium hypochlorite *and 2% chlorhexidine*. 82% of the respondents use conventional needle 27G for intracanal irrigation; 60% never use ultrasonic irrigation. ***Conclusions:*** *The analysis of the usage of irrigants shows that many general dental practitioners do not follow the quality recommended protocols for endodontic irrigation protocols.*

**Key words:** Endodontic Irrigants, Survey, Years of Professional Experience

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## Introduction

Endodontic irrigants play a crucial role in removing debris, microorganisms and smear layer. There are many endodontic solutions available which claim to help prepare and disinfect the root canal system[1,2,3]. Only a few have evidence to support their clinical use.

The studies have observed that Sodium hypochlorite (NaOCl) in range from 0.5% to 5.25% was the most commonly used irrigating solution, because of its antibacterial activity and ability to dissolve vital and necrotic organic tissue. However, sodium hypochlorite has no effects on the inorganic components of the smear layer. Acid solutions (3-10-40% Citric acid) and chelating agents (15-17% EDTA, Smear clear (Sybron Endo, Orange, CA) are recommended for removing the smear layer during chemo-mechanical preparation and as a final irrigation solution[3,4].

Chlorhexidine (CHX) is a potent antiseptic, which is used as endodontic irrigant in 2% concentration. CHX binds to hard dental tissue and remains antimicrobial up to 3 weeks. It has a broad-spectrum antibacterial action, sustained action and low toxicity. It is unable to kill all bacteria, cannot dissolve organic substances and necrotic tissue present in the root canal system, and cannot remove the smear layer[3,5].

Several studies have revealed that the majority of dentists do not follow the formulated guidelines on the quality of root canal treatment[5,6,7,8,9].

The aim of the present study was to describe the usage of irrigants by dentists in Bulgaria in relation to years of professional experience; the data were collected with the help of a questionnaire.

## Material and Methods

The present study was conducted amongst dental practitioners in Bulgaria with the help of a questionnaire. The questionnaire contained multiple choices questions as well as free-text spaces for additional comments. The survey contained 16 questions about the most frequently used irrigants such as NaOCl, $H_2O_2$, CHX, the respective concentrations, and the spectrum of disinfectants used during the root canal treatment. In addition, information about respondents' age, years of professional experience, gender, and main areas of continuing education was collected. Data were entered and processed with the statistical package IBM SPSS Statistics 22.0.

The following statistical methods were used: descriptive analysis, graphical analysis, alternative analysis, exactly test of Fisher, and $\chi^2$ test.

## Results

219 replies were evaluated. The majority of dentists (31.1%) had 21-30 years of professional experience. 18.7% had over 30 years (fig.1). Most of the practitioners reported that their continuing education covered mainly general dentistry – 52%, while about 1.2 % had covered endodontics in particular.

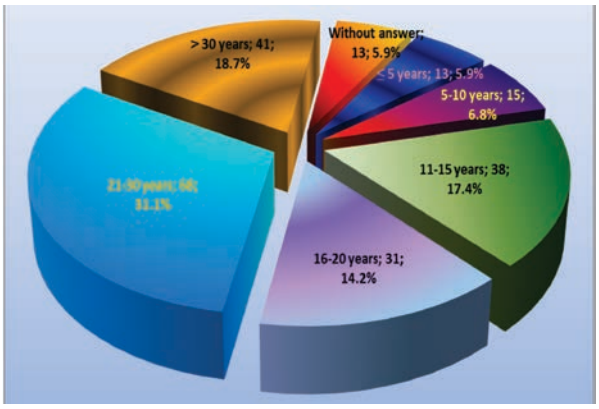


*Figure 1.* Distribution of survey respondents *by years of professional experience*

Dentists with long-standing professional experience used more often Hydrogen peroxide – 78%. For other endodontic irrigants: 2.5% NaOCl, 2% CHX, 5.25% NaOCl and 10% Citric acid no significant correlations were found between the usage and the years of professional experience of the respondents. 2.5% sodium hypochlorite is more often used by respondents with professional experience between 21-30 years – 66.2%, while 5.25% sodium hypochlorite is applied by dentists with up to 10-year professional experience - 64.3%. 2% CHX is more often used by dentists with over 30 year professional experience. Finally 10% Citric acid is used by practitioners with up to 10 years of practice – 25% (tabl. 1 and fig 2). Dentists with less experience (less than 10 years of professional experience) used 17% EDTA – 53.6%.

*Table 1. Analysis of the relation between type of endodontic irrigants and professional experience of respondents*

| Endodontic irrigants | Statistics | Professional experience (years) | | | | |
|---|---|---|---|---|---|---|
| | | ≤10 | 11 – 15 | 16 – 20 | 21 – 30 | > 30 |
| 3% hydrogen peroxide | N | 16 | 17 | 19 | 43 | 32 |
| | % | 57.1$^{ac}$ | 44.7$^{a}$ | 61.3$^{ac}$ | 63.2$^{ac}$ | 78.0$^{bc}$ |
| 2,5% sodium hypochlorite | N | 15 | 25 | 13 | 45 | 25 |
| | % | 53.6$^{a}$ | 65.8$^{a}$ | 41.9$^{a}$ | **66.2$^{a}$** | 61.0$^{a}$ |
| 17% EDTA | N | 15 | 7 | 6 | 16 | 7 |
| | % | 53.6$^{a}$ | 18.4$^{b}$ | 19.4$^{b}$ | 23.5$^{b}$ | 17.1$^{b}$ |
| 2% chlorhexidine | N | 7 | 13 | 11 | 24 | 18 |
| | % | 25.0$^{a}$ | 34.2$^{a}$ | 35.5$^{a}$ | 35.3$^{a}$ | **43.9$^{a}$** |
| 5,25% sodium hypochlorite | N | 18 | 20 | 17 | 38 | 19 |
| | % | **64.3$^{a}$** | 52.6$^{a}$ | 54.8$^{a}$ | 55.9$^{a}$ | 46.3$^{a}$ |
| 10% citric acid | N | 7 | 7 | 5 | 13 | 4 |
| | % | **25.0$^{a}$** | 18.4$^{a}$ | 16.1$^{a}$ | 19.1$^{a}$ | 9.8$^{a}$ |

*the different letters show that there is a significant difference ($p<0.05$)

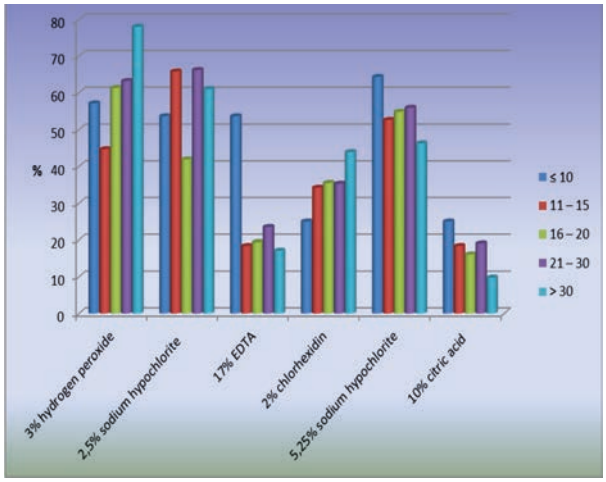


*Figure 2. Analysis of the relation between type of endodontic irrigants and professional experience of respondents*

The results presented in tabl. 2 and fig. 3 show that conventional 27G needles for endodontic irrigation are used most by respondents with professional experience up to 10 years - 82%, and least by those with 16-20 years professional experience. Conversely, endodontic needles are used most often by dentists having more experience (21-30 years) – 61.8%.

*Table 2. Analysis of the relation between types of needles used for endodontic irrigation and professional experience of respondents*

| Type of needles used for endodontic irrigation | Statistics | Professional experience (years) | | | | |
|---|---|---|---|---|---|---|
| | | ≤ 10 | 11-15 | 16-20 | 21-30 | >30 |
| Conventional needles 27G | N | 23 | 22 | 15 | 35 | 22 |
| | % | 82.1[a] | 57.9[ac] | 48.4[bc] | 51.5[bc] | 53.7[bc] |
| Endodontic needles | N | 9 | 20 | 15 | 42 | 23 |
| | % | 32.1[a] | 52.6[ac] | 48.4[ac] | 61.8[bc] | 56.1[ac] |

*the different letters show that there is a significant difference ($p<0.05$)

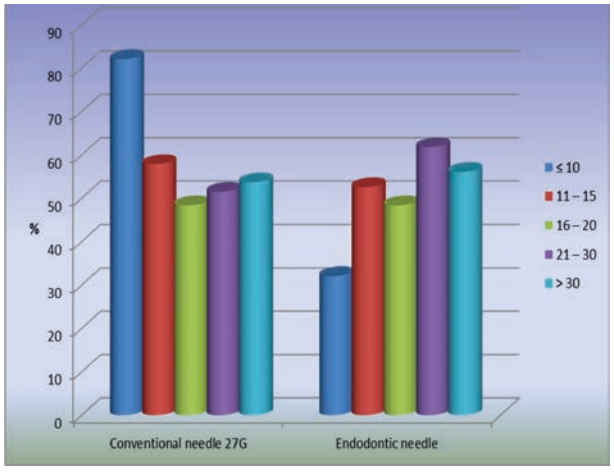


*Figure 3. Analysis of the relation between type of needles used for endodontic irrigation and professional experience of respondents*

The use of ultrasonic irrigation is significantly lower among dentists with professional experience over 30 years -75.6% of them have never used ultrasonic irrigation. The highest percentage for usage – 51.6% is recorded for the group with 16-20 years professional experience. For other groups of respondents there was no clear downward trend in the percentage of usage of ultrasonic irrigation with the increase of professional experience (Table 3 and Figure 4).

*Table 3. Analysis of the relation between use of ultrasonic irrigation and professional experience of respondents*

| Ultrasonic irrigation | Statistics | Professional experience (years) | | | | |
|---|---|---|---|---|---|---|
| | | ≤ 10 | 11 – 15 | 16 – 20 | 21 – 30 | >30 |
| Yes | N | 14 | 13 | 16 | 29 | 10 |
| | % | 50.0[a] | 35.1[ac] | 51.6[a] | 42.6[ac] | 24.4[bc] |
| No | N | 14 | 24 | 15 | 39 | 31 |
| | % | 50.0 | 64.9 | 48.4 | 57.4 | 75.6 |

*the different letters show that there is a significant difference ($p<0.05$)

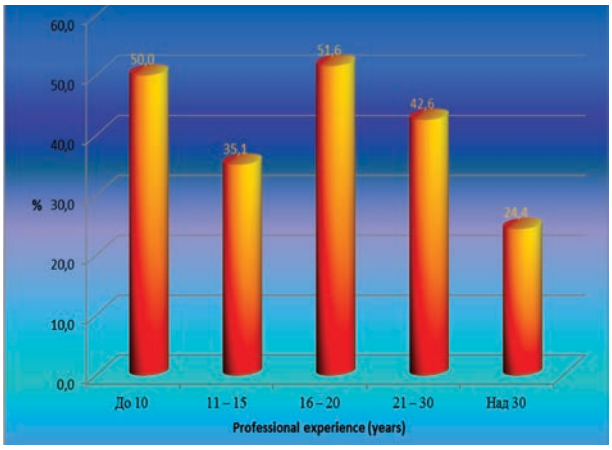


*Figure 4. Analysis of the relation between use of ultrasonic irrigation and professional experience of respondents*

## Discussion

The disinfectant has to fulfil various requirements. It has to be biocompatible and cause no damage to the tissues, it must have a long-lasting disinfecting property and it has to be removable. In many countries recommendations governing the use of possible irrigants exist for the dentists.

In the present study our results show that dentists with long-standing professional experience (over 30 years) use frequently hydrogen peroxide – 78%. Similar results are obtained by other authors. Willershausen et al.[5] concluded that dentists with longer years of professional experience in Germany used $H_2O_2$ significantly more often than NaOCl. But in their survey they established that in general 3% sodium hypochlorite is the most frequently used irrigant. Tosic et al.[7] in a survey performed in Serbia reported that the

most popular irrigant was Hydrogen peroxide, and it is used by all respondents regardless of their years of professional experience. For the respondents with professional experience from 6 to 20 years Hydrogen peroxide was the only irrigant for root canal treatment. Sodium hypochlorite was used as root canal irrigant only among dentists with 2-5 years of professional experience (28.5%). This was the result from their first survey. After a second survey (3 years later) NaOCl became the most popular irrigant in all groups and increased use of Chlorhexidine especially in the first group comprising young dentists[7].

In our study the results show that 2.5% sodium hypochlorite is more often used by respondents with professional experience between 21-30 years – 66.2%, while 5.25% sodium hypochlorite is applied by dentists with up to 10-year professional experience - 64.3%. The results were however not comparable to a survey performed in Australia which reported that 94% of dentists used sodium hypochlorite[10]. In other studies 80% of respondents use sodium hypochlorite[8]. Abtin H. et al.[9] reported that in British Columbia 94.22% of the general dentists used sodium hypochlorite, EDTA-36.23% and Chlorhexidine 14.66%.

An alternative irrigant is 2% CHX. In the present study the results show that 2% CHX is more often used by dentists who have over 30 years professional experience-43.9%. The use of chlorhexidine as a primary irrigant was found to be low (25% up to 10 years of professional experience) amongst the practitioners. This was similar to the survey conducted in Himachal Pradesh[8].

The total removal of the smear layer is preferred in order to improve the adaptation of the obturation materials in the root canal dentin and facilitate the diffusion of the irrigant solutions and intracanal medications into the root canal dentin. Our data correlated with other studies in which more than 50% of the dentists were methodically removing the smear layer before obturation[11]. In our study 10% Citric acid is used by 25% of the respondents and 53.6% used 17% EDTA (by practitioners up to 10 years).

In the present study 51.6% of the respondents with 16-20 years of professional experience use ultrasonic activation, while 75.6% of the dentists with professional experience of over 30 years have never used ultrasonic irrigation. The findings of the survey among the practising dentists in Chennai have shown that 40% of the respondents are using ultrasonic activation as an adjunct, as an aid to their irrigation technique.

We found that 82% of the respondents with up to 10 years professional experience used 27 gauge needle during mechanical activation. None of the respondents use negative pressure irrigation with system such as EndoVac.

In the present study, no question concerning the use of rubber dam was included. The review by Ahmad 2009 shows that rubber dam is not used as frequently as required in many general dental practices from various countries[12].

## Conclusions

- Dentists with less professional experience up to 10 years used higher concentration 5.25% NaOCl. They used 17% EDTA, 10% Citric acid for smear layer removal.
- Dentists with more years of professional experience used $H_2O_2$ more often frequently compared to their younger colleagues.
- The most commonly used needles for endodontic irrigation are 27G, followed by endodontic needles.

The analysis of the responses concerning the usage of irrigants showed that most general dental practitioners do not follow quality recommended protocols for endodontic irrigation.

## References


1. Vineet A, Rajesh M, Sonali K, Mukesh P. A contemporary overview of endodontic irrigants – a review. J Dent App, 2014;1:105-115.
2. Zehnder M. Root canal irrigants. J Endod, 2006,32:389-398.
3. Gulabivala K, Patel B, Evans G, Yuan-Ling NG. Effects of mechanical and chemical procedures on root canal surfaces. Endod Topics 2005,10:103-122.
4. Aranda-Garcia AJ, Carlos Kuga M, Chavéz-Andrade GM, Kalatzis-Sousa NG, Duarte MAH, Faria G et al. Effect of final irrigation protocol on microhardness and erosion on root canal dentin. Microsc Res Tech, 2013;76:1079-1083.
5. Willershausen I, Wolf T, Schmidtmann I, Berger C, Ehlers V, Willershausen B, Briseno B. Survey of root canal irrigating solutions used in dental practices within Germany. Int Endod J, 2015,48:654-660.
6. Hussain S, Khan F. Asurvey on endododntic irrigants used by dentists in Pakistan. Pak Oral Dent J, 2014;34:730-734.
7. Tosic G, Miladinivic M, Kovacevic M, Stojanovic M. Choice of root canal irrigants by Serbian dental practitioners. Vojnosanit Pregl, 2016;73:47-52.
8. Damanpreet Miglani S, Karda B, Sarangal P. A survey of irrigation practice among dental practitioners in Himachal Pradesh. Dent J Adv Stud, 2014;2:80-83.
9. Abtin H, Haapasalo M, Aleksejuniene J. Survay of irrigation protocols used by dentists in British Columbia. Research Day (Abstr.1), 2011.
10. Clarkson R, Podlich N, Savage N, Moule A. A survey of sodium hypochlorite use by general dental practitioners and endodontists in Australia. Aust Dent J, 2003;48:20-26.
11. Moss HD, Allemang JD, Johnson JD. Philosophies and practices regarding the management of the endodontic smear: results from two surveys. J Endod, 2001;27:537-539.
12. Ahmad IA. Rubber dam usage for endodontic treatment: a review. Int Endod J, 2009;42:936-972.


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