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Methods Of Sterilization of Endodontic Files Among Iraqi Dentists: Mix Method

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ABSTRACT

Objectives evaluate the knowledge of Iraqi dentists about the process of sterilizing endodontics files; to find the most familiar method and material are used among Iraqi dentists; Materials and Methods A questionnaire was delivered electronically to dentists in different specialties during May 2024. This questionnaire included questions about the demographics and professional backgrounds of the dentists, and their techniques used for sterilization of used endodontic files and materials used in sterilization was also questioned. Results Regardless of the specialty, it was found that the frequency of using sterilization by Autoclave were high between Iraqi dentist. Regarding disinfectant materials that used by Iraqi dentist in pre- sterilizing stage to clean the endodontic files the use of alcohol was the most commonly used material. Also the most of Iraqi dentist was aware about the effect of sodium hypochlorite on endodontic files during sterilization. Conclusions and Clinical Relevance Despite the quality guideline recommendations, the use of autoclave in sterilizing the endodontic files is the most frequent method among Iraqi dentists.

Keywords: Sterilization, Endodontics, Endodontic files, Autoclave, Alcohol, Sodium hypochlorite.

1 Introduction

One of the most important regions of cross-infection in the dental clinic was due to improper handling and sterilization. Control of infection was an important factor in providing comprehensive dental care. Another important matter of concern was the prevention of cross- contamination to dental staff and the other patients in daily dental practices by contaminated instruments [1]. Blood and saliva are important carriers of infection such as Hepatitis B, HIV and other blood- borne diseases. In endodontic treatments includes various procedure which involves blood contamination during the procedure therefore making it sterilize every instruments both rotary and hand files after every patients [2]. Sterilization is the procedure that kills the bacteria and other microorganisms, pathogenic and non-pathogenic in vegetative or spore form the surface of the material to be sterile. Chemical sterilization was used for the thermosensitive instrument, which cannot go for moist heat sterilization. For other than thermosensitive instruments all other instruments can be sterilized in an autoclave [3].

An autoclave was used for sterilization for all instruments used in dental clinic, it was important to ensure that all microorganisms are killed after the sterilization process. So the quality management on time to time basis was an important part of the sterilization procedure [3,4]. To check the reliability of the sterilization the biological indicators are used such as spore strips which changes color after completion of sterilization if the autoclave is working in good condition. The indicator strips check the efficiency of the sterilizer to kill the bacteria [5]. Sterilization of the instruments used in the operatory will only prevent the cross contaminations. If these instruments not sterilized properly may lead to cross contamination. Most common method used for sterilizing these instruments are autoclave, ethylene dioxide gas, glass bead sterilizer and dry

heat sterilizer [6].

So the aim of this study was to evaluate the knowledge of Iraqi dentists about the process of sterilizing endodontics files; to find the most familiar method and material are used among Iraqi dentists.

2 Materials and Methods

2.1 Survey questionnaire

2.1.1 Samples

An online survey was designed using google form to conduct 906 Iraqi dentists [7]. participants were postgraduate students who works in private clinic under supervision of a qualified dentist; others were general dentists and specialists from Baghdad and Thi-Qar.

2.1.2 Methods

A sheet form was created by google in November 2023 including five questions related to the sterilization process of endodontic files as seen in Table 1. The link of the survey was emailed to 906 participants, and it was valid for two months. The responses were collected automatically using Microsoft Excel for Microsoft 365 MSO (v.2403) and set for statistical analysis using IBM SPSS statistic software (v.29.0.1.1) [8].

Table 1. The questions of survey that send to dentists.

Survey's questions
1. Which material do you use as disinfectant for endodontic files before sterilization? a) Alcohol b) Disinfectant solution c) Chlorixidine d) Others ..... (mention the material) e) I don't know f) none
2. Which method do you use to sterilize endodontics files? a) Steam pressure sterilization (autoclave) b) Dry heat sterilization (oven) c) Chemical vapor sterilization d) Ethylene oxide sterilization e) Others ..... (mention the method)
3. How long does it take to sterilize the files depending on the sterilizing method you use in question 2? (Please mention the method and one choice for the time) Method: (1-30sec/2min/5-10 min./15-20min/30min./45min./1h-more/I don't know)
4. Will you use sodium hypochlorite for sterilization instead of Autoclave? a) Yes b) No c) I prefer not to answer
5. In general, does the incorrect sterilization affect on files? a) Yes b) No c) I don't know

2.2 Results

2.2.1 Survey questionnaire

Out of 906, only 103 participants have been responded to the questionnaire survey. They are postgraduate students from fifth grade and general dentists (101 and 2) respectively . The participants have different thoughts about the sterilizing process of endodontic files. Nearly half of them did not use any disinfectant agent as pre-sterilized materials. Other half, the most significant material was Alcohol and the least one was water, chlorhexidine, and glutaraldehyde as seen in Fig. 1. Regarding the sterilization method, autoclave was the favourite one while sterling solution was the slightest. The autoclave cycle time was mostly ranged between (15-20 min.) and (40-45min); the other materials varied from 1 sec to more than 1 hour, Fig. 2. But only one dentist prefers single use of endodontic files for each patient. However, 25 of 103 dentists may use sodium hypochlorite as a replacement for autoclave. Fig. 3 shows that their knowledge was highly significant about the side effects of sterilizing process on the endodontic files.

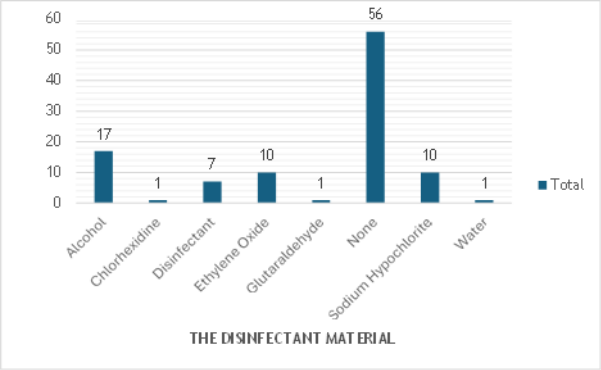

Fig. 1. Show the types of disinfectant materials that used by Iraqi dentist in pre-sterilizing stage to clean the endodontic files.

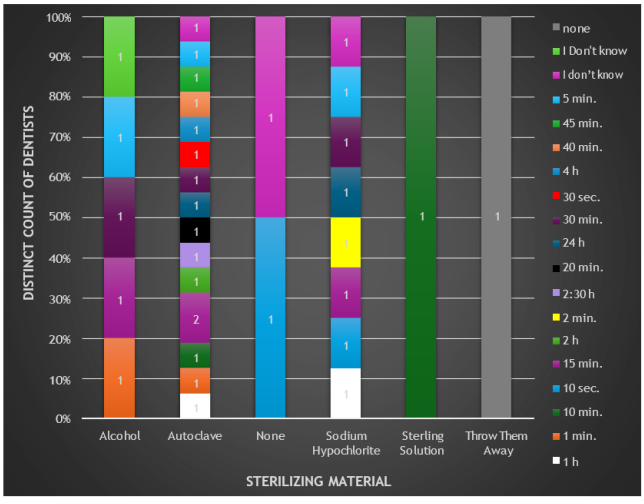

Fig. 2. Results of different types of sterilizing technique for endodontic files.

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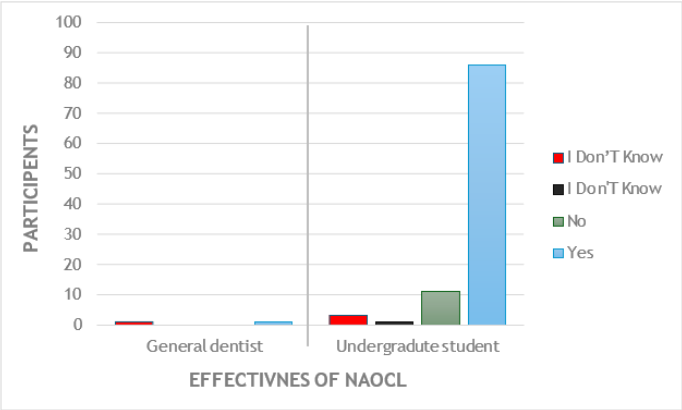

Fig. 3. The results of Iraqi dentists' awareness about the effectiveness of sodium hypochlorite on endodontic files.

3 Results

According to the results of this study the most commonly used method of sterilization of endodontic files used by Iraqi dentists was autoclaving Figure 2 followed by Sodium hypochlorite and Alcohol respectively.

Figure 2 shows a statistically high significant differences between Autoclave and Alcohol methods and non-significant differences$p < 0.05$ between Autoclave and Sodium hypochlorite also non-significant differences between sodium hypochlorite and alcohol usage in sterilization of endodontic files between Iraqi dentists and this finding agree with previous studies [9–12].

Autoclave was the most commonly used method in sterilization of endodontic files this related to the fact that this method use heat and pressure which lead to total destruction of bacteria, viruses, and spores is autoclaving at a minimum temperature of 120°C for 30 min [13,14].Countless studies report that heat sterilization (autoclaving for 30 min at 120 °C) causes stress on the rotating instrument, which more easily undergoes cyclic fracture during use [15–19].

While Sodium hypochlorite has corrosive effects on most endodontic instruments and files. Most of the studies on sterilization methods have demonstrated its effectiveness. In a study [20]. The minimum time taken to obtain optimal results was only one minute vs. 10 min with 1% sodium hypochlorite. The method involved both the cytoplasmic membrane, which induces the discharge of phosphorus and potassium ions, thereby altering the osmotic balance (concentrations between 0.12% and 0.2%), and the cytoplasmic level, through the induction of the precipitation of plasma proteins (concentration 2%) [21–23].

The use of 6% sodium hypochlorite as a method of sterilization was not shown to be efficient in a recent study performed by [24]. For the non-autoclavable and disposable material as for gutta-percha or resin cones [25]. The most suitable method to reduce the bacterial contamination present on these cones is disinfection by hypochlorite immersion with concentrations ranging from 2% to 5.25% for a minimum time of 5–10 min [26,27].

Ethyl alcohol is used as antiseptic in concentration of 70% it has a wide antibacterial range; it does not have spore action [28]; it is bactericide, inactive on Koch bacillus; it is used only in the disinfection of the instruments. These alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria; they also are tuberculocidal, fungicidal, and virucidal but do not destroy bacterial spores. Their cidal activity drops sharply when diluted below 50% concentration, and the optimum bactericidal concentration is 60%– 90% solutions in water (volume/volume) [29].

Alcohols dehydrate cells, disrupt membranes and cause coagulation of protein and have several disadvantages such as Skin irritant, volatile (evaporates rapidly) and inflammable [30].

4 Conclusions

Despite the quality guideline recommendations, the use of autoclave in sterilizing the endodontic files is the most frequent method among Iraqi dentists.

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Ethical consideration: The study was approved by University of Baghdad.
Data Availability: No data was used for the research described in the article.

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