

Evaluation of Perception and Care in the Sanitation of Toothbrushes

Avaliação da Percepção e Cuidados na Higienização das Escovas Dentais

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Recebido em: 20/10/2017; Aceito em: 21/12/2018

Abstract

Toothbrushes are daily contaminated by bacteria in the oral cavity or outside, therefore they are considered containers for microorganisms, capable of causing and transmitting diseases. The current work aimed to evaluate the knowledge and practices regarding hygiene and storage of toothbrushes, in order to compare actions executed by different groups, and identify the lack of adequate information when facing the subject. Data were collected through a questionnaire, in which three experimental groups were evaluated: 1- patients (n=50) treated at Sistema Único de Saúde (SUS), 2- Dental students (n=50) from Centro Universitário Doutor Leão Sampaio and 3- Dental clinicians (n=50) from Juazeiro do Norte. A descriptive analysis of frequency distribution was performed, and One Way Anova and Bonferroni Post Hoc tests were performed, at a significance level of 5%. In the current research, it was found that the group of Dentists has a greater knowledge and practice better actions regarding the toothbrushes sanitation, higher than that of the group of Students, which was better than that of the group of Patients. However, regarding storage, the groups demonstrated to have not enough information regarding the adequate place and the ideal manner of storing their toothbrushes. It was concluded that, the group of Dentists performs the most part of recommended maneuvers regarding the care for toothbrushes hygiene compared to the other evaluated groups.

Keywords: Contamination. Toothbrushing. Oral Health.

Resumo

As escovas dentais são contaminadas diariamente por bactérias presentes na cavidade oral ou no meio externo, por isso são consideradas depósitos de microorganismos, capazes de causar e transmitir doenças. O presente trabalho teve como objetivo avaliar o conhecimento e práticas quanto à higienização e armazenamento das escovas dentais, a fim de comparar ações executadas por grupos diferentes, e identificar falta de informações adequadas frente ao assunto. Os dados foram coletados através de questionários, em que foram avaliados três grupos experimentais: 1- Pacientes (n=50) atendidos no Sistema Único de Saúde (SUS), 2- Acadêmicos de Odontologia (n=50) do Centro Universitário Doutor Leão Sampaio e 3- Cirurgiões-dentistas (n=50) de Juazeiro do Norte, Ceará. Foi realizada análise descritiva de distribuição de frequência, Anova 1 critério e teste post hoc de Bonferroni foram os testes utilizados, adotando-se um nível de significância de 5%. Na presente pesquisa, constatou-se que o grupo dos Cirurgiões-dentistas tem maior conhecimento e praticam melhores ações quanto às práticas de higienização das escovas dentais, superior ao grupo dos Acadêmicos e esses dos Pacientes. Porém, em relação ao armazenamento, os grupos demonstraram não ter conhecimento acerca do local mais adequado e da maneira ideal para armazenar suas escovas. Conclui-se que, o grupo dos Cirurgiões-dentistas realiza a maior parte das manobras aconselháveis sobre os cuidados frente a higienização das escovas dentais relacionado aos outros grupos em questão, apesar de não ter conhecimento acerca de novas tecnologias para desinfecção das escovas.

Palavras-chave: Contaminação. Escovação Dentária. Saúde Bucal.

1 Introduction

The oral cavity is characterized as a conducive means to the colonization and growth of micro-organisms, of these, most commonly, the bacteria¹. Of these, the main microorganism responsible for the contamination caused by dental brushes is the *Streptococcus mutans*, found in saliva, transferable and directly related to the caries in the oral cavity, and may be transferred by both toothbrush and the toothpaste², where this microorganism can be kept viable in dental brushes for a period of up to 8 hours after drying of the same and for up to 44 h when they are wet³. In them different types of other microorganisms can also be found such as viruses or fungi⁴, including micro-organisms of the genera *Candida*, *Corynebacterium*, *Pseudomonas* and coliforms were also

identified. The importance of the daily of dental brushes disinfection was emphasized by researchers reporting that these microorganisms may stay for a period of 6 hours after its use, relating this contamination with a possible cross-infection². In addition, microorganisms of some infectious diseases, such as tuberculosis, hepatitis or AIDS, or still, syphilis and diphtheria can also be transferred by dental brushes of contaminated patients². Also, the bristles of the brushes are influenced by the environment where they are stored⁵.

The act of the washing the toothbrush in running water, beating the edge of the sink to remove the excess water, store them in a clean and dry place, in addition to spraying antiseptic substances on the bristles of the toothbrush after using, are recommended by the American Dental Association - ADA⁶, in

order to reduce the contamination. Currently the use of some antiseptic solutions for decontamination of dental brushes disinfection, among them, the chlorhexidine digluconate 0.12%, antimicrobial agent of first choice in dentistry⁷, sodium hypochlorite at 1%, used for decontamination of root canals⁸, acetic acid⁹, component of vinegar, and cetylpyridinium chloride⁵, present in some products for oral hygiene.

Various brushing methods are described, but the brushes disinfection after its use is little studied⁹, before this fact, this study aims to evaluate the knowledge and behavior regarding hygiene, decontamination and storage of tooth brushes, as well as the knowledge about the microorganisms transmission through the dental patients treated in SUS, Scholars of Dentistry Course and dental surgeons, besides analyzing the conduct of professionals and academics regarding the their patients' stage of guidance.

2 Material and Methods

For the accomplishment of the research, a questionnaire was elaborated considering the objectives of the present study. In which they were questioned regarding the time of use, selection criteria, procedures for storing and sanitizing the brushes, the usage time of the same and its importance for the oral and general health.

The study was conducted in the city of Juazeiro do Norte, interior of the state of Ceará. Specifically, the questionnaires were applied at Centro Universitário Dr. Leo Sampaio, at

Basic Health Units and Dentistry Offices in this city.

The sample was composed in a total of 150 participants, including:

- Patients treated in Sistema Único de Saúde (SUS) (n=50).
- Odontology Course Scholars enrolled in the ninth and tenth period (n=50);
- Dental Surgeons (n=50).

It was performed a descriptive statistics of frequency distribution of which, absolute and relative values, were used to describe the variables knowledge and actions. Anova (criterion 1) and Bonferroni post hoc test were used to assess the significance of the results to compare the (average or medians?) of the questionnaires scores used among the groups of patients, scholars and dentists. The size of the effect was estimated from the test "D Cohen", which values between 0 and 0.30 are considered weak effect, between 0.30 and 0.70 moderate and above 0.70 are considered strong effect¹⁰, in addition the values of $p < 0.05$ were considered significant.

3 Results and Discussion

The study was approved by the ethics committee of the Centro Universitário Doctor Leo Sampaio, under number No. 2.192.613. The results obtained in the present study are in the tables and graphs below:

In the present study, it was found that almost the totality of individuals is aware about the transmission of diseases through the toothbrush (Table 1).

Table 1 - Issues discussed in matters of knowledge

Knowledge matters	Yes		No		Yes		No		Yes		No	
	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%
Knowledge about the toothbrushes disinfection	23	46.00	37	74.00	35	70.00	15	30.00	41	82.00	9	18.00
Knowledge about the existence of sanitizers equipment	7	14.00	43	86.00	18	36.00	32	64.00	20	40.80	29	59.20
Toothbrushes disinfection as an important procedure	48	96.00	2	4.00	50	100.00	0	0.00	45	90.00	5	10.00
Means of transmission of diseases	42	84.00	8	16.00	48	96.00	2	4.00	46	92.00	4	8.00

Source: Research data.

ADA recommends that these must be packed separately in a vertical position on clean, dry place avoiding enclosed places¹¹. Avoid leaving them exposed in the bathroom. If they are kept in direct contact with this environment, they can be contaminated by fecal coliforms and *Pseudomonas*¹², also by enteric bacteria and yeasts of aerosol dispersion in common in this type of environment².

There are some controversies in the literature regarding the storage of toothbrushes in the medicine cabinet. Studies have reported that the medicine cabinet is not described as being the ideal location for the tooth brushes storage, nor the boxes and the protectors of bristles, because they maintain a humid and warm environment around the bristles, which may encourage the microorganisms growth. In addition, this

can promote the cross contamination, due to the fact that the head of these may come in contact with others in this places¹³. However, the cabinet prevents contamination of the bristles by enterobacteria, especially fecal coliforms from aerosols of unloading of the toilette¹⁴. A study showed that that none of the brushes kept in this place, showed growth of enterobacteria, while in 70% of the brushes maintained on the sink in the bathroom were found, two important genera of fecal coliforms, *Enterobacter* sp and *Citrobacter* sp¹⁵. Among the places of storage described above, it was found that the group of Patients and Dental Surgeons store their brushes with greater frequency in the medicine cabinet with brush protection and scholars in a jar with lid on the bathroom sink. In addition to these locations, other locations were cited

such as: another room around the house and on the angle bar of the bathroom, considered unusual locations. In addition, few individuals have cited the medicine cabinet without brush protection as choice, showing that a large proportion of individuals of the three groups in question do not store

their toothbrushes in places considered as more appropriate. A small percentage of participants of each group said to share these storage locations with other brushes, in which the group of Scholars and Patients were those who most claimed to have this habit, according to ADA's recommendations (Table 2).

Table 2 -Storage locations of dental brushes by groups.

Toothbrush storage	Patients		Scholars		Dentists		General
	Nº	%	Nº	%	Nº	%	%
Lying on top of the sink	3	6.00	0	0.00	1	2.00	3.67
On the sink inside a container without lid	4	8.00	4	8.00	10	20.00	14.67
On the sink inside a container with lid	8	16.00	16	32.00	14	28.00	33.33
Medicine cabinet with toothbrush protection	23	46.00	14	28.00	19	38.00	49.67
Medicine cabinet without toothbrush protection	0	0.00	4	8.00	1	2.00	4.67
Bathroom angle bars	6	12.00	2	4.00	2	4.00	9.33
Another room around the house	6	12.00	10	20.00	3	6.00	18.00

Source: Research data.

In spite of all individuals claiming to wash their brushes after use, this should not be the only conduct to be performed after brushing, to avoid the toothbrush contamination. Some precautions are recommended by the American Dental Association, after its use: washing in running water, then you must remove the excess water from the brush through bumps on the edge of the sink, avoiding the drying with towels, as well as the completion of disinfection, from chemical agents, by spraying on the bristles of the brush, such as antiseptics¹¹.

The present study showed that most of Dental Surgeons and then of Scholars, due to having more knowledge on the subject,

said to beat the brush on the sink to remove excess water, action performed immediately after the end of the brushing, in addition to these avoid drying in cloth or paper towels (Table 3), since the use of fingers in the bristles of the brush to remove the excess water is practiced by some of the participants of the groups in question, but the group of Patients presented a greater number of people, corresponding to more than half of those surveyed (Table 3), action not indicated, because it facilitates the toothbrushes growth with microorganisms of the type Staphylococcus, besides being related to the presence of fecal coliforms in the bristles of the brushes¹⁶.

Table 3 - Actions performed by groups after brushing.

Actions Performed After brushing	Patients				Scholars				Dentists			
	Yes		No		Yes		No		Yes		No	
	N	%	N	%	N	%	N	%	N	%	N	%
Beats the brush on the sink	19	38.0	31	62.0	27	54.0	23	46.0	32	64.0	18	36.0
Scrub finger on the bristles	26	53.1	23	46.9	24	48.0	26	52.0	18	36.0	32	64.0
Uses some specific substances	1	2.00	49	98.0	2	4.0	48	96.0	14	28.0	36	72.0

Source: Research data.

The toothbrushes disinfection is aware of all the groups evaluated, but only the group of Scholars and Dental Surgeons showed greater knowledge of the subject (Table 1). However, a minimum proportion of the Dental-Surgeon stated not to have knowledge about this disinfection process, despite being inserted in the professional environment and being responsible for the information passed on to their patients. Whereas in the group of Patients, the vast majority of individuals did not know about the subject, showing that the absence of information provided by the professionals directly affects the practice of care of patients with their toothbrushes. According to the survey, all groups use some type of specific substance on the brush after use (Table 3), in which the group of Dental Surgeons showed greater knowledge regarding the use of these substances, with a significantly higher percentage of the group of Scholars and even more to the group of

Patients (Table 3). However, even having stated the use of some kind of substance, the number of Dental Surgeons who use is considered small before the knowledge on the subject and its importance for the oral health. Thus, the study showed that the majority of the professionals are careless in relation to the toothbrush disinfection with specific substances for this purpose (Table 3).

Among the individuals who claimed to perform the disinfection of their dental brushes, chlorhexidine had a higher percentage of choice, standing out the group of dental surgeons with percentage of 18% and only 2% in the group of Scholars (Table 4), which is usually an indication as antiseptic of first choice in Dentistry, with high antimicrobial activity and ability to reduce micro-organisms in the pre-operative antiseptics⁹, the immersion of the brush during the night in this substance, at the concentration of 0.2%, shows high efficacy to

prevent microbial contamination¹⁷. In the present study, using it in 0.12% concentration, it was found the total elimination of *Streptococcus mutans*, in disinfection for 10 minutes, being also the most effective chemical agent before *Streptococcus pyogenes*⁹.

Table 4 - Substances used by groups for the toothbrush disinfection.

Substances	Patients		Scholars		Dentists	
	N	%	N	%	N	%
Chlorhexidine	0	0.00	1	2.00	9	18.00
Mouthwash	0	0.00	0	0.00	2	4.00
Hypochlorite	0	0.00	1	2.00	2	4.00
Oxygenated water	0	0.00	0	0.00	1	2.00
Detergent	1	2.00	0	0.00	0	0.00

Source: Research data.

In addition to this, the use of hypochlorite was reported by 2% of Scholars and 4% of Dental Surgeons (Table 4), this is found in different concentrations, at 1.0% as decontaminant agent, sprinkled on the bristles of the brush shows a decrease in bacterial growth¹⁸ and at a concentration of 2% absence of fungal species was observed in tooth brushes disinfected by immersion². However, its use for long periods of time is debatable, because it is not known for sure its residual effect on the bristles¹⁹. However, in spite of being an effective method, the sanitary water as a substance of domestic use is not indicated in daily use, since this can cause irritation in the oral mucosa and trigger the onset of stomach problems, if the brush is not properly rinsed¹⁹, showing that these groups use empirically this substance, not being the most indicated for daily use. Other types of substances were mentioned by a minority of participants, such as detergent, oxygenated water and mouthwash, this latter has as the most used active compounds the chlorhexidine, cetylpyridinium chloride, essential oils and triclosan²⁰, the latter, is present in the composition of some toothpaste, had in one study, a higher efficacy against *Streptococcus mutans* after analyzing the in vitro antimicrobial effect of various dentifrices available in the Brazilian market⁹, however other studies found no good results, considering chlorhexidine as antimicrobial substance of choice for the bristles disinfection²¹.

The use of oxygenated water (hydrogen peroxide), reported by 2% of dental surgeons (Table 4), is effective when stored in spray solutions or solution for immersion²⁰, while the detergent cited in the group of Patients, showed to be inadequate substance for the toothbrushes disinfection, because in studies microorganisms were identified in this substance, especially *Pseudomonas* spp, because the value of the PH is close to neutral, between 7.4 and 8.0²².

The disinfection process with these substances should be initiated as soon after the first use of toothbrush and maintained a daily routine of applying a new amount of clean solution every time it is used to keep them free of contamination⁵. In addition to these substances mentioned

above, there is on the market equipment with the purpose of making the toothbrushes sanitization that utilize technology ultraviolet (UV). This light acts mainly in the bacteria DNA, causing their death, moreover, a study performed with bacteria showed inactivation of growth after 20 min of UV irradiation for *Pseudomonas* sp., showing efficacy in the elimination of the same²³. In the present study, there was a lack of knowledge about the existence of these devices (Table 1), in which the group that presented lower percentage of knowledge was the Patients.

Given the importance related to the toothbrushes sanitation already mentioned previously, however, there are few studies that evaluate the cares of Dentistry Course Scholars regarding the toothbrushes, despite being in the Academic environment, and should receive important information for their formation¹⁹. It is believed that the academic environment influences completely in the scholars and dentists' hygiene habits, and that these reflect all their learning in society, where it was important to analyze the habits of 3 groups in matter to observe how the society has been absorbing the guidelines on the care with the toothbrushes. According to this study, all the scholars showed to have knowledge about the importance of the toothbrushes disinfection, as well as almost all Dental Surgeons and Patients also considered this procedure as important (Table 1), however, these do not use disinfectant substances, do not store in the most suitable place and have no knowledge about the equipment for disinfection.

The vast majority of Dental Surgeons and Scholars said to give guidelines to their patients regarding the toothbrushes sanitization, very important initial attitude to encourage patients to maintain their oral health, affecting significantly in their overall health and well-being. However, based on the results obtained through this study, it is still necessary to have guidance strategies that are enhanced during the undergraduate course, in order to inform, motivate and educate scholars to make them aware about this problem, on the change of habits and their role as an educator in society²⁴. This orientation is of great importance, because the knowledge and practices acquired during undergraduate studies are taken to the future professional practice and may influence the care guidelines delivered to patients.

4 Conclusion

It can be concluded that there was statistical difference regarding the knowledge and recommended actions about hygiene care of toothbrushes, in which the Dental-Surgeon has greater knowledge when compared to other groups, and practice most of the recommended actions. However, regarding the conduct of appropriate storage and knowledge of new technologies with the aim of dental hygiene there is a lack of information for the three analyzed groups.

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