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Study on the Treatment of Reusable Care Equipment in Public and Private Dental Practices in the City of Conakry

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Abstract

Introduction: The effective sterilization of reusable instruments in dental care is a crucial issue for public health. The aim of this study was to contribute to improving the processing conditions of reusable care instruments in dental practices in the city of Conakry. **Methods:** We carried out an observational and cross-sectional study of a descriptive type lasting three months from January to April 2022 in public and private dental practices approved for activities. **Results:** A total of 48 dental practices were surveyed, including 7 public and 41 private. 91.67% had the trays for instrument sterilization. 77.08% had a sterilization device. The instruments were: cleaned 100%, disinfected 70.83%, sterilized 20.83% and 20.83% reused the instruments without being sterilized. 72.97% sterilized the instruments at the end of the day. 50% of respondents declared that there were six stages of sterilization. According to standard standards, one dental office or 2.70% respected the normal sterilization process and 13.51% respected the duration and temperature. The storage quality was inadequate at 95.83%. 95.83% of dental practices are at high risk of contamination. The difficulties encountered by staff in daily activity during our study were lack of hygienists (87.50%), insufficient material resources (58.33%), and lack of protocol procedure (45.83%). **Conclusion:** This study allowed us to note shortcomings of dental surgeons in the process of processing reusable care materials.

Keywords

Treatment, Materials, Care, Reusable, Dental Practices, Conakry

1. Introduction

The treatment of reusable healthcare equipment is all the care carried out on medical equipment used on a patient using chemicals, physical means or technical means allowing its reuse on several patients without bringing pathogenic germs to a patient [1]. In the dental care environment, the risk of infection is omnipresent. The viral risk is particularly important in this context not only for the dentist, but also for the patient due to exposure to biological fluids, thus promoting the transmission of microorganisms [1]. The mouth is known to contain a wide range of microorganisms, such as fungi, bacteria and viruses. Effective procedures to prevent cross-infection between dentists, dental staff and patients are therefore essential [2]. Effective sterilization of reusable instruments in dental care is a critical public health issue [3]. Despite the regulation of medical devices in the dental office, the scale of invasive procedures requiring the use and reuse of instruments makes their treatment complex and difficult [4]. The practitioner must implement an effective asepsis chain and traceability; respecting the different stages of the asepsis chain meets 3 specific objectives [4]:

- Avoid cross-contamination from patient to patient.
- Avoid any contamination of healthcare personnel.
- Gradually reduce the bacterial load and dirt during the sterilization chain in order to sterilize a clean and dry device.

The concepts of mechanical and chemical cleaning are the imponderables of delicate care in our profession, which aims to eradicate any possibility of bacterial proliferation inside the dental structure [5]. Dentists who routinely perform interventions during which their instruments come into contact with the blood or secretions of patients are particularly concerned by this problem [6]. In addition, they are faced with the emergence of prion diseases, the mode of transmission of which has an impact on their sterilization practices [6]. The sterilization of reusable and sterilizable instruments is more than ever an effective safeguard against the risk of transmission of pathologies [6].

Several studies carried out around the world [1] [6] have shown that the cold sterilizer is frequently used in the treatment of reusable care materials by dental surgeons and that this frequency varies depending on the level of knowledge and information of the dental surgeons. Therefore, it follows from all these studies that good practice in the treatment of reusable materials is largely linked to the level of development of the countries. The objective of this work is to contribute to the improvement of the conditions for processing reusable care instruments in dental practices in the city of Conakry, evaluate compliance with the stages of processing reusable materials in the 48 public and private dental practices in the

city of Conakry, determine the conditions under which reusable materials are processed and identify the difficulties encountered by staff in recycling healthcare materials.

2. Material and Methods

2.1. Type and Duration of Study

It's about a double-part study, the first of which was quantitative, transversal of a descriptive type and the second qualitative based on a noted observation that took place from January to April 2022 in private and public dental practices in the city of Conakry.

2.2. Sampling Technique

This study was not based on a specific sampling method, but on the other hand, it carried out an exhaustive recruitment of 48 dental practices including 7 public and 41 private in the city of Conakry. During the study period, all dental practices were included in our study the public or private companies approved in activity whose managers have accepted their participation in the investigation. Dental practices listed but which ceased care activities or were not approved and those whose managers did not consent to participate in the study were excluded.

2.3. Operational Definition of Variables

The different study variables described were qualitative (Availability of devices, Steam autoclave, Poupinel, Processing practice, Disinfected, Cleaned, Rinsing, Drying, Packaging, Sterilized, Non-sterilized, Timing of sterilization, Sterilization stages, Storage quality, Adequate storage quality, Inadequate storage quality, Risk, Low risk, Medium risk, High risk, Difficulties encountered) and quantitative (Sterilization temperature, Sterilization temperature, Sterilization temperature, Normal temperature, Abnormal temperature, Number of stages of sterilization).

2.4. Collection of Data

Data was collected using the KoBoCollect version v2021 application 2.4, and then analyzed using the SPSS 21 software.

Proportions were calculated for qualitative variables and quantitative variables.

The entry and presentation were carried out using Word, Excel and PowerPoint software from Office Pack 2016.

2.5. Data Analysis

We carried out an analysis descriptive of the characteristics of the sample using the median for quantitative variables and the proportion for qualitative variables.

2.6. Ethical Considerations

The protocol for this study was approved by the scientific committee of the Department of Odontology of the Faculty of Health Sciences and Techniques of the Gamal Abdel Nasser University of Conakry and registered under number 195/UGANC/2023 of the Rectorate. Informed consent from each respondent was obtained before data collection.

3. Results

Our study included a total of 48 private and public dental practices whose staff answered the various questions correctly despite poor working conditions in some dental practices. Private dental practices were the most visited, *i.e.* 85% (Figure 1). Lare Trays for sterilizing instruments were the most available processing devices either 91.67%, followed by Water point either 89.58% (Table 1). As for the practice and respect of dental surgeons in their service for the treatment of medical equipment, pre-disinfection with Pre-disinfection tray, Immediate soaking after intervention and Manual cleaning with brushing are the most used aseptic-antiseptic methods, *i.e.* 100%. Cleaning with the pre-disinfection tray is practiced, *i.e.* 97.92%, rinsing in the tray is most commonly done, *i.e.* 97.92%, drying in the open air on an absorbent support is most practiced, *i.e.* 83.33%, packaging with No packaging is frequently encountered in different dental practices, *i.e.* 97.92%. Sterilizers existed in 77.08% of dental practices and storage in the sterilizer was represented at 58.33% (Table 2). The end of the day was the time to sterilize the equipment reusable care either 72.97 (Table 3). Dentists with knowledge of the six stages of sterilization were the most numerous either 50% (Table 4). As for the normality of the temperature depending on the duration sterilization, sterilization with abnormal temperature was the most encountered either 86.49% (Table 5). Inadequate storage was dominant either 95.83% (Table 6). In terms of risks of contamination of reusable healthcare equipment, the high risk (R3) was higher, *i.e.* 95.83% (Table 7) and finally according to the difficulties encountered in daily activity for better management of material processing reusable care, Lack of hygienists in the different practices was the most observed situation either 87.50% (Table 8).

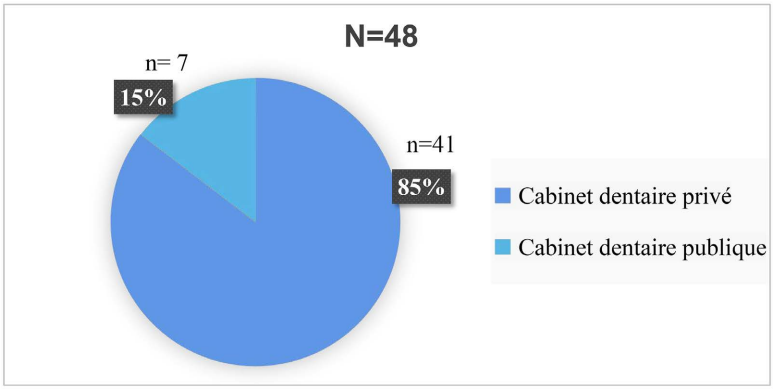

Figure 1. Distribution of public and private dental practices surveyed.

Table 1. Distribution of the 48 public and private dental practices in the city of Conakry depending on the availability of the devices necessary for processing the materials of reusable care in 2022.

Treatment availability	Workforce	Proportions (%)
Trays for instrument sterilization	44	91.67
Water point	43	89.58
Sodium hypochlorite	42	87.50
Sterilization device	37	77.08
Specific clean area (room) for conditioning and sterilizing instruments	2	4.17
Pre-disinfection bins for used equipment containing a disinfection solution(Sodium hypochlorite 0.05)	28	58.33
Soap/detergent	13	27.08
Alcohol	6	12.50

Table 2. Distribution of the 48 public and private dental practices in the city of Conakry according to the practice and respect of dental surgeons in their service for the treatment of medical equipment in 2022.

Treatment practice	Observation	Workforce	Proportions (%)
Pre-sanitized	Pre-disinfection tray	48	100
	Mixture of water and sodium hypochlorite (0.05%)	34	70.83
	Immediate soaking after intervention	48	100
	Soaking time (10 - 15 min)	9	18.75
Cleaning	Manual cleaning with brushing	48	100
	Cleaning in a tank different from that of pre-disinfection	1	2.08
	In the pre-disinfection tray	47	97.92
	Cleaning in the washing machine	0	0.00
Rinsing	Running water (tap)	1	2.08
	In a bin	47	97.92
Drying	Air dry on an absorbent surface	40	83.33
	Wipe with a lint-free towel	8	16.67
Conditioning	Using packaging	1	2.08
	Without packaging	47	97.92
Sterilization	Sterilizer	37	77.08
	Without sterilization	10	20.83
Storage	In the sterilizer	28	58.33
	In a cupboard	20	41.66

Table 3. Distribution according to the times for sterilizing materials of reusable care in the 48 public and private dental practices in the city of Conakry in 2022.

Sterilization period	Workforce	Proportions (%)
At the end of the day	27	72.97
During the day	17	45.96
At the start of the day	11	29.73
After each patient	10	27.03

Table 4. Distribution of the 48 public and private dental practices in the city of Conakry according to the level of knowledge of dental surgeons on the number of steps in the sterilization of materials of reusable care in 2022.

Number of steps	Workforce	Proportions (%)
6	24	50
5	13	27.08
7	7	14.58
4	4	8.33
Total	**48**	**100**

Table 5. Distribution of the 48 public and private dental offices in the city of Conakry according to the normality of the temperature according to the duration sterilization materials of reusable care in 2022.

Duration-temperature	Effective	Proportion (%)
Unnatural	32	86.49
Normal*	5	13.51
Total	**37**	**100**

Normal*: For autoclave users: 121˚C for 20 min and 134˚C for 18 min; For poupinel users: 160˚C for 2 hours; 170˚C for 1 hour and 180˚C for 30 min.

Table 6. Distribution of the 48 public and private dental practices in the city of Conakry depending on the storage quality of the materials of reusable care in 2022.

Storage quality	Number	Proportion (%)
Inadequate	46	95.83
Adequate	2	4.17

Table 7. Distribution of the 48 public and private dental practices in the city of Conakry according to the risks of contamination of reusable care equipment in 2022.

Risk level	Score	Effective	Proportion (%)
Low risk (R1)	**1**	**1**	**2.08**
Medium risk (R2)	**3**	**1**	**2.08**
High risk (R3)	**3**	**46**	**95.83**

Table 8. Distribution of the 48 public and private dental practices in the city of Conakry according to the difficulties encountered in daily activity for better management of material processing of reusable care in 2022.

Encountered difficulties	Workforce	Proportions (%)
Lack of hygienists	42	87.50
Insufficient hardware resources	28	58.33
Lack of protocol procedure	22	45.83
Insufficient human resources	9	18.75
Water and electricity cut	5	10.42
Difficulty troubleshooting the sterilization device (autoclave, poupinel)	3	6.25
Lack of sterilizer	3	6.25
Sterilizer failure	2	4.17
Difficulties in sterilizing plastic equipment	1	87.50

4. Discussion

We carried out our investigation in public and private dental practices in the city of Conakry. Today this is a first study on the treatment of reusable equipment in dental office services in the Republic of Guinea. The study being based on a questionnaire whose data were obtained from the responses of certain dentists and cleaning agents and/or observation, they were therefore partly subjective. This study conducted only in urban areas may produce results that do not reflect the situation in rural areas. The treatment of reusable healthcare equipment is a phenomenon which is motivated by their contamination as well as the prevention and control of infections. During our study, we surveyed 48 dental practices in the city of Conakry regarding the processing of reusable healthcare equipment including 41 private dental practices and 7 public dental practices (**Figure 1**). This could be explained by the fact that certain practitioners prefer to work in the private sector than in the public sector but also the insufficiency or lack of State investment policy in the establishment of a high number of practices. It emerges from our study that availability of trays for sterilizing instruments at 91.67%, availability of water points for cleaning instruments at 89.58% (**Table 1**). This could be explained by the fact that the standards require that there is an appropriate, specific place, meeting all the conditions for the processing of medical devices and that health care facilities comply with national water access policies. For the practice of dental surgeons 100% put the instruments in a pre-disinfection tray, only 70.83% used sodium hypochlorite at (0.05%), the soaking time was respected by 9 dental practices or 18.75% (**Table 2**). Cleaning was carried out manually by brushing in all cases observed, *i.e.* 100% (**Table 2**). Traoré *et al.* [7] in Mali in 2016 in a study made the same observation in six hospitals in Mali and Senegal. Manual technique is less standardized and less reproducible and exposes staff to risks of contamination and injury. The acquisi-

tion of a washer disinfector could therefore improve the quality of cleaning and the safety of staff and patients. Furthermore, cleaning was carried out directly in the pre-disinfection bath in 97.92% of the cases observed (Table 2). Pre-disinfection and cleaning are two distinct phases which must be carried out separately provided that a washer disinfector is used. Rinsing the equipment after cleaning was carried out in a tray containing water by 97.92% of dental practices and 2.08% rinsed with running water (Table 2). Rinsing with running water is ideal for rinsing in a tank because chemical agents can be redeposited on the equipment, which could compromise the cleanliness of the equipment. Drying in the open air on an absorbent support was carried out by 40 dental offices, *i.e.* 83.33% and 16.67% wiped with a lint-free towel (Table 2). The results of this study could be explained by negligence, and/or ignorance of procedures. Cunin in 2012 in France [6] reported that 99% of practitioners cleaned their instruments after each use. The packaging prevents re-contamination of sterilized equipment between the place of sterilization and the place of use. In this study, we found that instruments were not packaged before being sterilized, with only 2.08% using packaging before sterilization (Table 2). Sombié *et al.* [8] in 2022 in Burkina Faso reported that no instrument was packaged before sterilization. This could compromise the quality of sterilization and maintenance of sterile status. 77.08% practitioners sterilized the instruments, on the other hand, 20.83% reused the instruments without being sterilized (Table 2). Using the instruments without being sterilized could lead to nosocomial contamination. The sterilization steps were not respected at all. Panta *et al.* [9] in 2022 in Nepal reported that 70% of health professionals adhered to Andhad a good knowledge of the different aspects of sterilization and reuse of medical devices. Negligence on the part of staff, failure to appreciate the importance of the sterilization process in controlling the risk of infection, and insufficient control by those responsible for supervision in dental practices are the reasons for this. Practitioners who stored instruments in sterilizers were estimated at 58.33% compared to 41.66% who stored them in a cabinet (Table 2). 72.97% of practitioners carried out sterilization at the start of the day (Table 3). Our results could be explained by the lack of specific personnel responsible for sterilization and the reduced number of patients. Majzoub *et al.* [10] in 2018 in Lebanon noted that in 75% of dental practices, dental assistants sterilized as needed 4 to 6 times a week. According to the number of stages of sterilization, 50% noted that there are 6 stages (Table 4). Our results could be explained by the fact that dentists pay attention to standard figures. The French Dental Association [11] in 2015 reported according to standard standards that there are six stages of sterilization in the dental office. For duration and temperature, 86.49% had abnormal duration and temperature (Table 5). The poor condition of certain sterilizers, the lack of mastery of the standards and principles of sterilization did not make it possible to achieve 100% compliance with sterilization standards. Literature [12] states that for the heat-sensitive cycle, sterilization is at 121˚C for 20 minutes for heat-sensitive objects and for other heat-resistant materials, sterilization is at 134˚C for 18

minutes. Sombié *et al.* in 2022 in Burkina Faso [8] reported that steam sterilization at 134˚C for five minutes was used to sterilize metal medical devices in all cases observed at the sterilization unit. Concerning the quality of storage, 58.33% left the instruments in the sterilizer, 41.66% stored them in a cabinet and the quality of this storage was inadequate at 95.83%; only one dental office has complied with the standards for storing sterilized medical devices in a specific area protected from direct sunlight, humidity and contamination of all kinds due to the fact that it has a specific room for the treatment and packaging of reusable healthcare equipment (**Table 6**). Panta *et al.* [13] in Nepal in 2020 in their study noted that there was a separate area allocated for the storage of sterilized medical devices *i.e.* 40.9%. Our results could be explained by a lack of space for better storage in dental offices and this storage area for sterilized equipment was not reserved only for sterile medical devices and was not well maintained. This could lead to a risk of recontamination of materials. Faget [14] in 2011 in France reported that 25% of the premises are insufficient in size for the quantity of material stored and 15% of the storage premises have windows with exposure to direct sunlight. Based on these results, failures were observed during the sterilization process of reusable instruments that could jeopardize the safety of the patient and even the practitioner. Failures to adequately sterilize these medical devices can lead to nosocomial infections. 46 dental practices out of 48, or 95.83%, run a very high risk of patient contamination through failure to properly treat reusable instruments (**Table 7**). In their attempt to follow the steps, 2.08% have an average risk of contamination (**Table 7**). This result could be explained by the fact that all the conditions allowing good processing of the instruments are not met. Khomsi *et al.* [15] in 2019 in Morocco reported a high infectious risk during sterilization due to non-compliance with hygiene rules, insufficient material resources and staff not sensitized in their studies. Our results showed certain difficulties encountered in the daily life of dental surgeons for better management of the treatment of materials such as lack of hygienists 87.50%, insufficient material resources 58.33% (**Table 8**). This could be explained by the lack of an adequate strategy in the management of the dental practice and the negligence of the authorities in charge of oral health. Cronk *et al.* [16] in 2018 in their study on environmental conditions in health facilities in low- and middle-income countries reported that 50% of establishments do not have running water on site, 33% do not have adequate sanitation facilities, 73% do not have sterilization equipment, and 59% do not have reliable electricity.

The main limitation of our study is the reluctance of certain dental surgeons to take part in the survey and the difficulties in identifying certain pre-existing dental practices. However, this study was conducted in leading dental practices in the country and our results provide basic information that can guide future research regarding the treatment of reusable care materials in public and private dental practices in the city of Conakry.

5. Conclusions

This study allowed us to observe the presence of several dental practices in the city of Conakry, to identify shortcomings of dental surgeons in the process of processing reusable care materials. Problems related to the sterilization of medical devices have been identified (lack of hygienist, insufficient material resources, and water and electricity cuts). Most practitioners do not sterilize their instruments before reuse. The sterilization cycle was not respected by the majority of practitioners.

This study could be extended to the national level in order to have an overall vision of the processing practices of reusable care materials in dental practices in our country.

Authors' Contributions

ABN, MC, AAC, JYS, MD, AT, TK, and KPA participated in the design of the protocol. ABN, MC, AAC, JGYS, MD and AT were involved in the acquisition, analysis and interpretation of the data. ABN, MSF, MD, TK and MAD reviewed the manuscript. All authors read and approved the final version and agreed to publication.

Data Availability

Data regarding this study are available upon request from the authors.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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