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Analysis of Solid Waste Management in Dental Clinics Located in Rio Grande Do Sul

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Abstract: One of the main challenges that involve the environmental sanitation problem is proper solid waste management. Several aspects relative to the production and management of the different types of waste produced in dental offices have a negative impact on humans and on the environment. In light of this, the present paper sought to evaluate the volume of waste generated by three facilities of a network of dental clinics. Through a qualitative approach, a questionnaire was drawn up with open questions to be answered by three dental clinics. The questionnaires were collected in the month of October 2020, and the respondents were collaborators of three companies based in the cities of Marau, Dom Pedritoand São Gabriel, located in the State of Rio Grande do Sul. In the sequence, after getting all necessary information, the following steps were taken: the transcription of the answers, a descriptive analysis of collected data and the interpretation of the results. It was ascertained that in all dental clinics investigated, the collection and disposal procedures are similar. It was concluded that among the waste generated by the facilities, the one that requires the most care is general waste, like paper, cardboard boxes, plastic wrap, due to the amount discarded and the lack of a management plan for recycling this type of waste, seeing that there is no selective collection in most municipalities.

Key words: environmental management, dental office waste, sustainability

1. Introduction

The environmental question has become a serious problem that affects the present and the future of humanity, thus mobilizing governments and civil society.

Over the past decades, several programs and practices were established with the aim to protect and minimize the negative impacts on the environment. This set of procedures has emerged in the context of government programs and legislations, as well as in the countless initiatives by associations, groups and organizations on behalf of the environment [1].

Day after day there is an increase in the consumption of natural resources, whose consequences could include drinking water scarcity, biodiversity loss and increased pollutant levels, especially as far as global climate change is at stake.

Nevertheless, nowadays, it has become more and more evident that an ever-increasing number of companies have adhered to the sustainability concept in their strategies. The companies should encompass new perspectives with regard to their responsibilities as agents that possess financial, organizational and technological resources for a more efficient, decisive and direct performance towards the solution for the social and environmental problems [2]. Appropriate management of solid waste is one of the main challenges that involves the problem of environmental sanitation.

The approach to the so-called healthcare waste (RSS, in the Portuguese acronym) is equally indispensable, as this waste has a great potential to damage the environment and, above all, it is harmful to public health [3].

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The management of healthcare waste is something that requires much attention from the administrations of public and private organizations, by virtue of their inherent characteristics and hazardousness. This procedure requires a specific manner of handling, storing, collecting, transporting and disposal, seeing that waste generated by healthcare institutions could cause diseases and other types of damages. These wastes can be dangerous because they contain infectious agents, as well as chemical, toxic, radioactive substances, or cutting and piercing objects [4].

Several aspects with regard to production and management of the different types of waste produced in dental clinics, have a negative impact on humanity and on the environment.

According to Mota et al. (2004) [5], though several harmful effects are attributed to solid waste, they could be eliminated, or at least mitigated, provided they are managed correctly.

The dental health activity is responsible for the generation of paper, plastic and glass waste, a diversity of disposable products, like gloves, anesthesia and suture needles contaminated with body fluids, and equally a small amount of mercurial and silver remains, solvents and other chemical products. It is therefore indispensable to analyze and implement solid healthcare waste management policies (RSSS) in the various healthcare institutions, whilst establishing an organization and systematization process for these sources responsible for the generation of waste.

In this edition, the aim of the study consists in analyzing the wastes generated by three organizations of dental services.

2. Methodology Used

This paper used the qualitative research method. Qualitative research is concerned with listening to what people have to say, exploring their ideas about a specific subject. As for the objectives, the study is classified as descriptive. According to Gil (2008), descriptive research is about the description of the characteristics of a distinct population or phenomenon.

A structured questionnaire was drawn up, containing 25 open questions. Open questions lead to different answers when it comes to obtaining opinions, feelings, beliefs, attitudes or behavior of the surveyed person. The questions were drawn up with the aim to identify information about each participating facility, like number of collaborators, year the facility was inaugurated and its location.

The methodology used for the collection consisted in sending a questionnaire by e-mail to each dental clinic. The structured interview was carried out on the basis of a set of questions, whose order and wording remain invariable for all interviewees.

A set of questions consists in a structured methodology for the collection of data, comprising a series of questions, either written or oral, an interviewee has to answer. The aim of this formal set of questions is to get information from the interviewees [6].

The questionnaires were collected in the month of October 2020, and the respondents were collaborators of three companies based in the cities of Marau, Dom Pedrito and São Gabriel, located in the State of Rio Grande do Sul. In spite of the fact that data collection took place during the pandemic, the research did not suffer any reflections from the situation. The interviewees were codified to ensure confidentiality, and they were denominated CO1 (Dental Clinic 1); CO2 (Dental clinic 2) and CO3 (Dental Clinic 3).

In the sequence, after getting all necessary information, the following steps were taken: the transcription of the answers, a descriptive analysis of collected data and the interpretation of the results, described as follows.

3. Results and Discussion

In the first question the interviewees were asked about the year the dental clinics were implemented.

CO1 said the clinic was founded in 2012. CO2, in 2011 and, finally, CO3 started operating in 2007.

With regard to the number of collaborators, CO1 and CO3 have twelve collaborators and CO2 has ten collaborators.

3.1 Results Analysis of Dental Clinic 1

The CO1 respondent did not inform the monthly purchases of the following items: gloves, dental suction device, sterile sucker, disposable bib, sterilization rolls and gauzes. The respondent only informed that monthly disposals reach approximately 2,200 pairs of gloves, 240 suckers, 20 units of sterile suckers, and approximately 300 units of disposable bibs, 1 unit of 25 cm × 50 m sterilization roll, 2 units of 7.5 cm × 50 m and 15 cm × 50 sterilization rolls, approximately 1,000 units of common gauzes and 1,000 units of sterile gauzes.

The respondent also informed that the unit buys approximately 100 units of fanfold caps, 10 units of sterile gloves, around 100 needles, and around 150 units of X-Ray film, 200 units of cotton wool rolls, 48 units of needle thread, 1 unit of Lidocaine, 1 unit of Mepivacaine and 100 units of Articaine — anesthetics used in surgical procedures. The dental clinic also purchases 2 units of dental developers which make it possible to check the X-Ray image, and 2 units of stabilizers used in radiological procedures, providing stabilization, protection and preservation of the X-Ray image. The COI dental clinic did not inform the quantity of the abovementioned materials that were disposed of.

3.2 Analysis of Dental Clinic 2 Results

The CO2 respondent did not inform about the purchases of the following items, gloves, common sucker, sterile sucker, disposable bib, sterilization rolls and gauzes. He only informed that the clinic discards approximately 2,000 units of gloves, 320 units of common suckers, 20 units of sterile suckers, around 150 units of disposable bibs, 1 unit of 7.5 cm × 50 m sterilization roll and 1 unit of 15 cm × 50 m, approximately 500 pieces of common gauzes and 2,000 pieces of sterile gauzes.

The respondent of the CO2 Dental Clinic informed that monthly purchases amount to approximately 50 units of fanfold caps, 10 units of sterile gloves, 100 units of needles, around 75 units of X-Ray film, 800 units of cotton wool rolls, 48 units of needle thread, 3 units of Lidocaine, 2 units of Mepivacaine, approximately 1 dental developer and 1 stabilizer. The dental clinic 2 respondent did not inform the quantity of the abovementioned materials that were disposed of.

3.3 Analysis of Dental Clínica 3 Results

The respondent of Dental Clinic CO2 also failed to inform the amounts of the following items that were purchased: gloves, common sucker, sterile sucker, disposable bibs, sterilization rolls and gauzes. He only informed that disposals include approximately 2,000 pairs of gloves, 400 units of common suckers, 20 units of sterile suckers, around 150 units of disposable bibs, 1 unit of a 7.5 cm × 50 sterilization roll and 1 unit of 15 cm × 50 sterilization roll, around 1,000 pieces of common gauze and 1000 pieces of sterile gauze.

The Dental Clinic 3 respondent informed that monthly purchases include approximately 100 units of fanfold caps, 10 pairs of sterile gloves, 100 units of needles, approximately 75 units of X-Ray film, 1000 units of cotton wool rolls, 48 units of needle tread, 2 units of Lidocaine, 2 units of Mepivacaine, 50 units of Articaine, around 1 unit of dental developer and 1 unit of stabilizer. The dental clinic 3 respondent did not inform the quantity of the above mentioned materials that were disposed of.

3.4 Classification of the Healthcare Sevices Waste (RSS) From Dental Clinics CO1, CO And CO3

Through the Board of Directors' Resolution (BDR) nº 306/04 [7] and Resolution nº 358/05 [8], the National Health Surveillance Agency (ANVISA) and the National Environment Council (CONAMA)

classify the Healthcare Services Waste (RSS) into five big groups A, B, C, D and E (refer to Picture #1), including in group A the wastes with a higher potential to disseminate infections.

Table 2 features the classification of materials purchased and disposed of at Dental Clinics CO1, CO2 and CO3.

According to RDC nº 306/2004 [7], wastes generated in healthcare services should be managed through The Health Services Waste Management Plan (PGRSS) which describes such actions as separation, conditioning and identification of waste at the moment and place of generation, in accordance with the physical, chemical biological properties of each waste, as well as the elimination and final disposal of the wastes.

As shown in Table 2, Group A wastes predominate, classified as infectious. These wastes carry biological agents and cannot be recycled, reutilized or reused. They should be kept in plastic bags, in color milky-white, properly identified and temporarily stored in washable containers, resistant to cracks, punctures and leaking, with specific lid, so as to avoid any hand contact until collected by the company in charge.

Group B wastes contain chemical substances in their composition, like developers and stabilizers for taking X-Rays.

They should be disposed of in plastic drums, which, once having achieved their capacity limit, should be collected by the subcontracting company responsible for collecting and for the final disposal of these wastes.

Class D wastes are the ones that pose biological, chemical or physical hazards, and can be disposed of as general waste and collected by the municipal waste collection service.

Table 1 Classification of healthcare services wastes [7].

Classification of RSS	Nature
Group A	Biological wastes or with their presence, which could pose a risk of contamination (infecto-contagious)
Group B	Wastes that contain chemical substances, with environmental contamination risks or impact on public health.
Grupo C	Radioactive scrap.
Group D	Common waste, which do not pose any risk to humans or to the environment.
Group E	Piercing or cutting waste or prone to scarification.

Table 2 Classification of wastes generated and purchased in the three dental offices.

Material	Purchased	Disposed of	Classification
Gloves		X	Group A
Sterilization rolls 7.5 cm × 50 m 15 cm × 50 m 25 cm × 50 m		X	Group D
Sterilesucker		X	Group A
Sterilegauze		X	Group A
Sucker		X	Group A
Gauze		X	Group A
Cottonwoolroll	X		Group A
Cap	X		Group D
Needle	X		Group E
Anesthetics (Lidocaine, Mepivacaine, Articaine)	X		Group E
X-Rayfilm	X		Group B
Threaded needle for suture	X		Group E
Developer	X		Group B
Stabilizer	X		Group B

Purchased wastes are class E, for the most part. They should be disposed of in puncture-resistant drums (Descarpack boxes), which, after reaching their capacity limit, are collected by the company responsible for collecting contaminated materials.

It was ascertained that CO1, CO2 and CO3 resort to outsourced services, through contract, for the collection of Class A and B wastes, and Sterycicle is the company responsible for collecting dental clinic wastes. Sterycicle is a company founded in the United States and expanded the collection of these wastes worldwide. Waste collection is carried out on a weekly basis, and a monthly fee is paid for this service.

Finally, it was ascertained that in all dental clinics investigated, the collection and disposal procedures are similar.

Among all types of wastes generated by the dental offices the one that requires the most care is general waste, like paper, cardboard boxes and plastic wrap due to the quantity discarded and the lack of a management plan for recycling this type of waste, seeing that there is no selective collection in most municipalities. On the other hand, class A and B wastes are disposed of correctly, according to specific legislation.

4. Conclusions

This paper sought to analyze the volume of dental supplies purchased per month and the amount of wastes disposed of by three dental clinics. It was perceived that the respondents omitted important information on the supply and disposal of dental materials.

It was ascertained that the most discarded wastes belong to Class A, classified as wastes containing biological contaminants. Their correct disposal is incineration or autoclaving process by authorized company.

Purchased wastes are classified as Group E, for the most part, and they are known as piercing and cutting wastes, and should be disposed of in landfills by the responsible collecting company.

The literary revision led us to the conclusion that all steps that involve the management of healthcare services wastes are important.

Finally, having a good grasp of the type of waste produced in dental clinics while patients are served, makes it possible to keep an appropriate control over the amount of waste generated.

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