

Dental students' clinical, ethical, and legal perception on healthcare waste management

Daylana Pacheco da Silva*, Maysa Luna de Souza**, Graciela Maria Oliveira Sipaúba***, Mariá Soares Leal de Moura****, Valdimar da Silva Valente*****, Carmem Dolores Vilarinho Soares de Moura*****

- * PhD Student in Dental Clinics, Universidade Estadual de Campinas, Piracicaba
- ** Undergraduate Student, Universidade Federal do Piauí
- *** Master student in Dentistry, Universidade Federal do Piauí
- **** Undergraduate Student, Uninovafapi
- ***** Professor, Department of Restorative Dentistry, Universidade Federal do Piauí

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ABSTRACT

The aim of this study was to analyze the dental students' clinical, ethical and legal perception on the management of health services waste (HSW). This was a cross-sectional observational study, with census sampling of students from the 8th (n=23) and 9th (n=18) terms. The applied questionnaire addressed the process of production, handling and disposal of HSW, regarding management, legislation and ethical issues. Data were organized in spreadsheets and interpreted by descriptive analysis. Regarding the current rules for the management of WHS, 82.9% and 95.1% of the students stated that they did not know the final treatment/disposition and technical regulation for HSW management, respectively. Regarding the Health Services Waste Management Plan (HSWMP), 85.4% did not know the Criminal Code and 87.8% were not familiar with the Civil Code. In addition, most respondents were unaware of the principles of the Brazilian Association of Technical Standards (75.6%) and the Resolutions of the National Environmental Council (82.9%) and the National Health Surveillance Agency (95.1%). On the other hand, 73.2% claimed to know the rights and duties of the dental surgeon, present in the Code of Dental Ethics. Regarding the classification of residues produced in a dental environment, 95.1% answered correctly about sodium hypochlorite and 97.6% about cotton and blood gauze rollers. Therefore, it was possible to conclude that there is satisfactory knowledge about the clinical and ethical aspects, however insufficient regarding the current legislation in Brazil.

Descriptors: Health Services Waste. Dental Students. Minimization of Environmental Damage. Solid Waste Packaging.

1 INTRODUCTION

The challenges that modern society faces about the difficulties regarding waste disposal embrace a range of sectors, such as industry, work, environment, health and education. Therefore, they need management directly related to public health¹.

Healthcare Services Waste (HSW) can be materials contaminated by pathogenic microorganisms, which are produced in hospitals, dental clinics, laboratories, pharmacies, veterinary clinics and health facilities in general¹. Disposal should be carried out according to the National Health Surveillance Agency (ANVISA) classification, considering the main nature of the waste and its risk potential, being subdivided into five groups: A - biological; B - chemicals; C - radioactive; D - domiciles; and E - sharpening and scarifying materials².

Even if the amount of infected material present in dental waste is small, there is a risk of cross-infection and the danger of environmental contamination when such waste is inadequately managed³. Thus, the dental surgeon becomes responsible for the segregation, storage and proper disposal of all waste produced in their workplace.

Thus, the Health Services Waste Management Plan (HSWMP), in agreement with the Resolution of the National Environment Council (CONAMA) 358/2005, sets out the actions equivalent to its management and covers aspects related to generation, segregation, packaging, collection, storage, transportation, treatment and disposal, as well as the protection of public health, ensuring the maintenance of environmental quality⁴.

Among the health and waste resolutions, should be highlighted the Brazilian Regulatory Standards (NBR) 7500 (hazard and handling symbols for the transportation and storage of materials), 9191 (plastic bags for waste disposal),

10004 (hazardous materials for public health and the environment on solid waste) and 12235 (hazardous solid waste storage)⁵⁻⁸. In addition, the National Health Surveillance Agency (ANVISA) established, through Resolution of the Collegiate Board (RDC) no. 33/2003, the technical regulation for the management of SSR, also determining the legal responsibilities with regard to the handling, treatment and final disposal of this waste⁹.

To understand the management of HSW, it is necessary to interfere in the educational process of the dental course in a positive way, in order to guide the development of theoretical and practical knowledge during clinical stages, motivating the training capacity of dentists conscious about environmental responsibilities¹. Therefore, some authors have investigated the perception of academics, regarding the discard of HSW¹⁰⁻¹². Given this conception, the present study aimed to analyze the Federal University of Piauí (UFPI) dental students' clinical, ethical and legal perception about the management of HSW.

2 METHODOLOGY

This study was approved by the Research Ethics Committee of UFPI, with protocol No. 2,602,023. Participants were informed about the research objectives and signed a free and informed consent form (FICF), following the Resolution of the National Health Council CNS 466/12.

This is a cross-sectional observational study conducted with students of the last year of a Dentistry Course in a Public Higher Education Institution of Teresina/PI. For data collection we used a questionnaire developed and tested by Fernandes¹³, containing 33 open and closed questions. This questionnaire was used due to its integral approach to the production process, handling and disposal of solid health waste, regarding management, legislation and ethical

issues. The questionnaire was applied through an online form strictly following Law No. 12,965 of April 23, 2014, which establishes principles, guarantees, rights and duties for the use of the internet in Brazil.

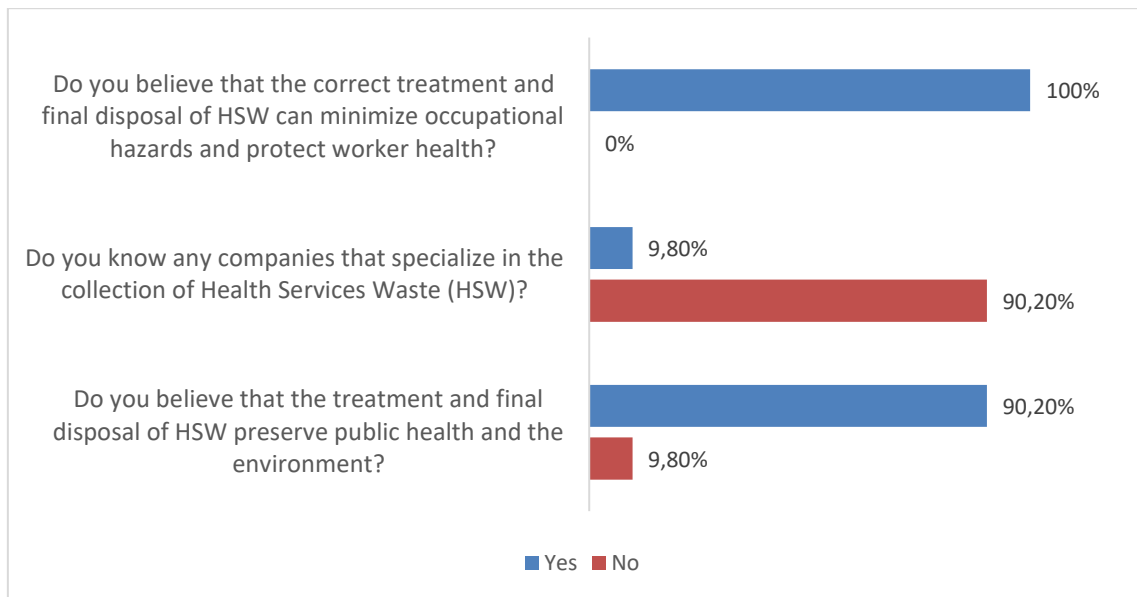
The sample was census-based and included students regularly enrolled in the 8th (n=23) and 9th (n=18) terms of the UFPI Bachelor of Dentistry Course. The inclusion of the participants had as criterion: they have already attended or to be studying the discipline that contemplates the theme addressed in this research. Data were organized in Microsoft Office Excel 2013 Spreadsheets (Microsoft, Redmond, WA, USA) and interpreted by descriptive analysis.

3 RESULTS

Out of the students who participated in the research, it was found that 70.7% (n=29) were female and 90.2% (n=37) were aged between 20 and 25 years.

Among the interviewees, all believe that WHS should be collected by specialized service, however, only four students know specific companies in this area. In addition, 90.2% believe that proper treatment and final disposal of HSW preserve public health and environmental quality. Still in this context, all understand that the correct treatment and final waste disposal can minimize occupational hazards in the workplace and protect the health of the worker (graph 1).

Graph 1. Knowledge of academics about the treatment and final disposal of Health Services Waste (HSW)



When asked about the types of harmful agents present in the dental office, in a multiple choice question, 97.6% say they are biological

and chemical agents. Thus, 97.6% consider that HSW should be handled with Personal Protective Equipment (PPE) (table 1).

Table 1. Health Services Waste Knowledge

| Variable | n (%) |
|--|-----------|
| <i>Do you know what Health Care Waste is?</i> | |
| No | 5 (12.2) |
| Yes | 36(87.8) |
| <i>What type of harmful agent is present in the dentistry office?*</i> | |
| Biological | 40 (97.6) |
| Chemicals | 40 (97.6) |
| Physicists | 34(82.9) |
| <i>Do you believe that waste should be handled with PPE?</i> | |
| No | 40 (97.6) |
| Yes | 1(2.4) |

* Multiple Answer Question

Regarding the HSWMP, 85.4% do not know the Criminal Code in relation to bodily injury and crimes against public health, and consequently are not familiar with the Civil Code, regarding illicit acts and reparation of damages (87.8 %). In addition, most respondents

are unaware of the ABNT Standards (75.6%), and CONAMA Resolutions (82.9%), and ANVISA (95.1%). On the other hand, 73.2% claim to know the rights and duties of the dental surgeon, present in the Dental Code of Ethics (table 2).

Table 2. Academic knowledge of current legislation for the Waste of Health Services Management Plan

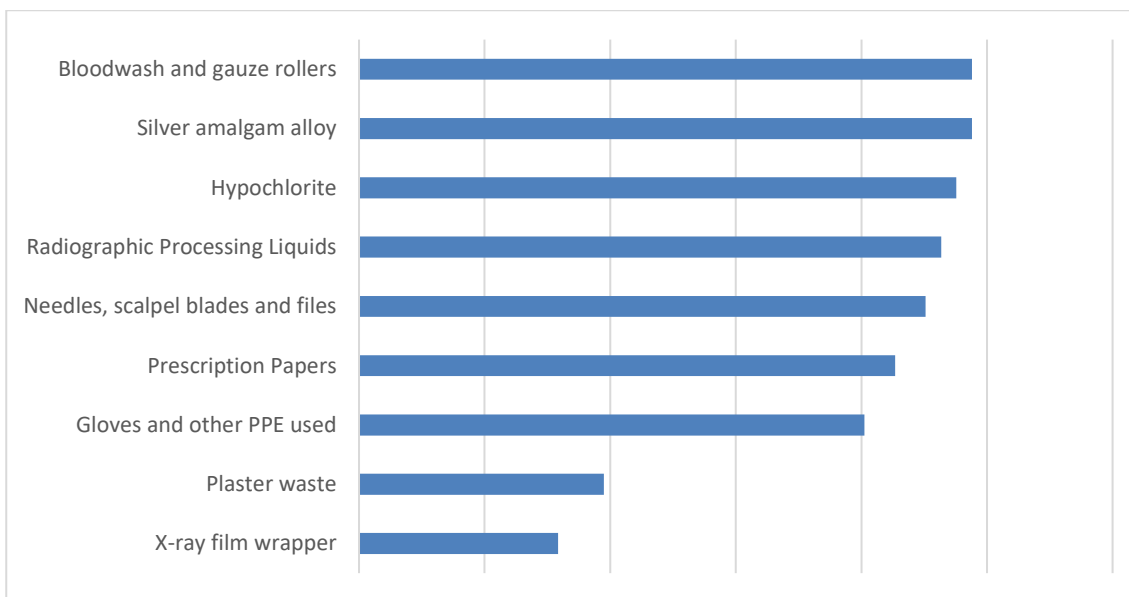
| Variable | n (%) |
|--|-----------|
| <i>Do you know the decree Law 2848/40 regarding bodily injury and crimes against public health?</i> | |
| No | 35 (85.4) |
| Yes | 6 (14.6) |
| <i>Do you know Law 10.406/02 regarding illicit acts and reparation of damages?</i> | |
| No | 36 (87.8) |
| Yes | 5 (12.2) |
| <i>Do you know ANVISA Resolution RDC No. 306/04?</i> | |
| No | 39 (95.1) |
| Yes | 2 (4.9) |
| <i>Do you know Ordinance No. 485 NR32 (Occupational Health and Safety Provisions)?</i> | |
| No | 33 (80.5) |
| Yes | 8 (19.5) |
| <i>Do you know CONAMA Resolution No. 358/05?</i> | |
| No | 34 (82.9) |
| Yes | 7 (17.1) |
| <i>Do you know CFO Resolution No. 42 of May 20, 2003 on the rights and duties of the Dental Surgeon (Dental Code of Ethics)?</i> | |
| No | 11 (26.8) |
| Yes | 30 (73.2) |
| <i>Do you know ABNT Standards, especially NBR 7500, NBR 9191, NBR 10004, and NBR 12235?</i> | |
| No | 31 (75.6) |
| Yes | 10 (24.4) |

When asked about the classification of nine different types of waste present in dental offices, we obtained the results shown in graph 2.

Regarding the correct classification of the type of residue, the plaster and radiographic film casings were the options that obtained the most

divergence in the categorization. It was observed that all students answered correctly about the proper disposal of sharps and radiographic processing liquids. Regarding mercury conditioning, most students (97.6%) answered correctly (table 3).

Graph 2. Distribution of correct answers regarding each type of waste generated by the dental offices



The undergraduates were asked to comment on the legislation in force in Dentistry and on the content taught during the undergraduate course, relevant to the theme of the applied questionnaire. Thus, a variety of answers were obtained, which were classified as "positive", "negative" or "could not give an opinion". For comments on the legislation of the

profession, positive answers were considered as coherent, efficient and fair; as bureaucratic negatives, needs improvement and outdated. As for the curriculum content, it was considered positive to talk about one of the topics addressed and negative when containing the terms superficial, was not taught and little addressed (table 4).

Table 3. Students' knowledge of the Healthcare Waste Management Plan

| Variable | n (%) |
|---|-----------|
| <i>Regarding the packaging of residual mercury, do you believe it should be in an unbreakable container with a lid containing water inside?</i> | |
| Yes | 40 (97.6) |
| No | 1 (2.4) |
| <i>Is the proper way to dispose of radiographic developer and fixer liquids by storing them in sturdy capped vials and then forwarding them for special collection?</i> | |
| Yes | 41(100) |
| No | - |
| <i>Regarding the container for packaging the discarded sharps (needle, scalpel blades, etc.), do you believe that it should be placed in rigid, waterproof, break-resistant and labeled containers?</i> | |
| Yes | 41(100) |
| No | - |

Table 4. Distribution of cases according to open answers

| Variable | n (%) |
|---|-----------|
| <i>Perception of current legislation in Dentistry</i> | |
| Positive | 17 (41.5) |
| Negative | 14 (34.1) |
| I couldn't give my opinion | 10(12.4) |
| <i>Perception about the content taught during the undergraduate course relevant to the theme of the applied questionnaire</i> | |
| Positive | 13 (31.7) |
| Negative | 22 (53.7) |
| I couldn't give my opinion | 6(14.6) |

4 DISCUSSION

The lack of standardization in the management of HSW can cause compromises to human health and the environment¹⁴. Therefore, all establishments that offer health services should develop their own disposal management plan, with the objective of minimizing waste production and providing safe and efficient conduction of this process¹⁵. Thus, the results of this study show that although academics believe that waste treatment is capable of preserving public health and the quality of the environment, only 9.8% know a collection company specialized in the area. This fact shows that students' theoretical knowledge is not

experienced in practice.

In the Dental Code of Ethics¹⁶, Resolution No. 071/2006 expresses the duty of the Dental Surgeons to refuse practice in the public or private sphere when working conditions are not dignified, safe and healthy, as well as to ensure the health and dignity of patients. As noted, most students claim to know their rights and duties, showing the ability to interfere with the workplace, as well as identifying inappropriate conditions for HSW management.

The legislation gives the health facility the responsibility for proper disposal of the HSW, and the professionals managing it. In the studies by Borges *et al.* (2016)¹⁷ and Alves *et al.*

(2016)¹⁸, failures were observed at various stages of waste management, not meeting the principles advocated by current legislation. In addition, Alves *et al.* (2016)¹⁸ show the professionals' lack of knowledge about the resolutions that regulate the management of HSW. This fact directly influences future management in the formation of professionals aware of their duties.

The amount of potentially infectious residues generated in dental offices is significantly lower when compared to hospitals, but chemical residues of mercury, glutaraldehyde, sodium hypochlorite, revealing material and radiograph fixer¹⁹ are generated. Thus, most respondents consider that the main HSWs are chemical and physical and should be handled with PPE.

Regarding the correct classification of waste types, it was found that plaster residues and radiographic film casings were the items that had the highest percentage of categorization error. Gypsum residues do not present a biological or chemical risk to health or the environment and can be compared to household waste. The wrapping of radiographic films, on the other hand, is considered a chemical waste, because the lead-blades, when disposed of incorrectly, can result in contamination of the soil and groundwater²⁰. Thus, lead blades must be packaged separately and identified with the associated hazard symbol in accordance with NBR 7500, and subsequently sent to the Industrial Hazardous Waste Landfill²¹.

Regarding the correct storage of sharps blades and residual mercury, there was agreement on the health risk from these residues, with a high percentage of hits, as well as in studies by Pereira *et al.* (2015)¹⁰ and Melo *et al.* (2008)²². This fact can be attributed to the greater emphasis given by teachers during the undergraduate course on these materials, probably due to the high rate of sharps accidents

reported in the literature²³. Mercury, on the other hand, is an admittedly toxic substance, so much so that it was the first chemical to be subject to exposure control legislation²⁴. Thus, according to RDC No. 173/17, the manufacture, importation and sale of mercury and unencapsulated amalgam alloy powder used for dental purposes throughout the national territory is prohibited²⁵.

Regarding the disposal of radiographic revealing material and fixative liquids, Pereira *et al.* (2015)¹⁰ and Fernandes (2009)¹³ obtained results contrary to the present study. Therefore, a positive point for society is highlighted, since the environmental problems caused by these contaminants range from water contamination to their deposition in native areas²⁶.

Regarding the students' perception on the legislation in Dentistry and contents taught during graduation course, a significant number of them were dissatisfied, suggesting reformulation and updating of the content, emphasizing the rights and duties of dental surgeons in the management of HSW. Regarding the contents taught, the academics stated that many were not addressed during the course, or were presented with deficits. In this regard, the fact highlights the need to broaden debates in the academic environment in order to raise students' knowledge about the subject. In view of this, the course collegiate was alerted to the importance of revising the contents of the disciplines that address legal and civil issues.

This deficiency in academic knowledge mirrors the professional performance. As observed by many authors^{20,26,27,29-31}, those responsible for management need more training on the subject, as this process involves numerous failures.

Given these results, we suggest that research related to the management of HSW, legal and civil aspects, should be carried out in other courses of Dentistry and Basic Health

Units, to know the reality of other regions. In addition, this topic should be addressed more objectively and efficiently at undergraduate level, so that future professionals can actively participate in the waste management process.

5 CONCLUSION

The students' knowledge in the present sample about Health Services Waste management is satisfactory regarding the clinical and ethical aspects, but insufficient regarding the legal aspects.

RESUMO

Percepção clínica, ética e legal de acadêmicos de Odontologia sobre gerenciamento de resíduos de serviços de saúde

O objetivo desse estudo foi analisar a percepção clínica, ética e legal de acadêmicos do curso de Odontologia sobre o gerenciamento de Resíduos em Serviços de Saúde (RSS). O estudo foi do tipo observacional transversal, com amostragem censitária de acadêmicos do 8º(n=23) e 9º(n=18) períodos. No questionário aplicado abordou-se o processo de produção, manuseio e descarte dos RSS, no que concerne ao gerenciamento, legislação e questões éticas. Os dados foram organizados em planilhas e interpretados por meio de análise descritiva. Sobre as normas vigentes para o gerenciamento de RSS, 82,9% e 95,1% dos estudantes afirmaram desconhecer o tratamento/disposição final e regulamento técnico para o gerenciamento de RSS, respectivamente. Em relação ao Plano de Gerenciamento de Resíduos de Serviços de Saúde (PGRSS), 85,4% não conhecem o Código Penal e 87,8% não estão familiarizados com o Código Civil. Além de disso, a maioria dos entrevistados desconhece as Normas da Associação Brasileira de Normas Técnicas (75,6%) e as Resoluções do Conselho Nacional do Meio Ambiente (82,9%) e da Agência Nacional de Vigilância Sanitária (95,1%). Por outro lado, 73,2% afirmam conhecer os direitos e deveres do cirurgião-dentista, presentes no Código de Ética Odontológica. Quanto à classificação dos resíduos produzidos em

ambiente odontológico, 95,1% responderam corretamente sobre o hipoclorito de sódio e 97,6% sobre os roletes de algodão e gaze com sangue. Portanto, foi possível concluir que existe conhecimento satisfatório sobre os aspectos clínicos e éticos, entretanto insuficiente quanto às legislações vigentes no Brasil.

Descritores: Resíduos de Serviços de Saúde. Estudantes de Odontologia. Minimização de Prejuízos Ambientais. Acondicionamento de Resíduos Sólidos.

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Correspondence to:

Daylana Pacheco da Silva
e-mail: daylanapachecos@gmail.com
Universidade Federal do Piauí
Rua Miosótis, 1135 - Jóquei
64048-908 Teresina/PI Brazil