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Original Article

Evaluation of quality and quantity of solid wastes in Babol Dental Faculty–North of Iran

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Abstract

Introduction: Dental wastes are a main part of urban solid wastes in each society and have pathogenic agents and toxic chemicals, which put health of patients, personnel and other referees to dental clinics in danger. The present study was done to recognize the quality and quantity of the different generated wastes at various parts of the Faculty of Dentistry-Babol University of Medical Sciences.

Methods: The whole solid wastes generated in the odd and even days (Monday, Tuesday and Wednesday) of the middle of the week from the second month of each season were examined. Various dental solid wastes including general, infectious and hazardous chemical wastes were weighted by typical scale.

Results: The generation rate of the solid wastes were: total dental wastes: 291.2 kg including general solid wastes: 251.3 kg (%86.3), infectious wastes and sharps: 38 kg (%13) and hazardous chemical waste: 2 kg (%0.7). The total amount of wastes in a year was 69888 kg. The solid wastes are daily produced according to each active dental unit as total, domestic-type, infectious and the hazardous chemical wastes were 3.07 kg, 2.65 kg, 0.4 kg and 0.02 kg, respectively.

Conclusions: Considering the quality and quantity of the generated dental solid wastes especially infectious wastes and their unfavorable effects on the peoples' health and environment, it is necessary to compile a distinct policy for the management of these medical solid wastes. Also, holding training workshops, knowledge of the staffs in the dentistry care centers should be increased to avoid possible dangers.

Keywords: Dental solid waste, Faculty of dentistry, Babol

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Solid wastes in Faculty of Babol Dentistry

ارزیابی کیفی وکمی مواد زائد جامد در دانشکده دندانپزشکی بابل

چکیده

مقدمه: زباله های دندانپزشکی بخش اعظم مواد زائد جامد شهری هرجامعه را تشکیل داده و دارای عوامل بیماری زا و مواد شیمیایی سمی است که سلامت بیماران، کارکنان و دیگر مراجعین به کلینیک های دندانپزشکی را به مخاطره می اندازد. مطالعه حاضر جهت تعیین کیفیت و کمیت مواد زائد تولید شده ازبخش های مختلف دانشکده دندانپزشکی بابل انجام گرفته است.

مواد و روش ها: همه مواد زائد روزهای فرد وزوج (دوشنبه، سه شنبه و چهارشنبه) هفته میانی ماه دوم هرفصل مورد آزمایش قرار گرفت. مواد زائد جامد مختلف شامل زباله های عمومی، زباله های عفونی و زباله های شیمیایی خطرناک توسط ترازوی دیجیتال بادقت ۰/۰۰۱ گرم توزین شد.

یافته ها: میزان تولید زباله ها به قرار زیر بود: کل زباله های دندانپزشکی ۲۹۱/۲ کیلوگرم که شامل مواد زائد جامد عمومی ۲۵۱/۳ کیلوگرم (۸۶/۳٪)، زباله های عفونی و تیز ۳۸ کیلوگرم (۱۳٪) و ترکیبات شیمیایی خطرناک ۲کیلوگرم (۰/۷٪) بوده است. میزان کلی زباله در یکسال ۶۹۸۸۸ کیلوگرم بوده است. زباله ای که روزانه براساس هر بخش فعال دندانپزشکی تولید می شود به عنوان زباله کلی دندانپزشکی، زباله عمومی، زباله عفونی و تیز و ترکیبات شیمیایی خطرناک به ترتیب ۳/۰۷ کیلوگرم، ۲/۶۵ کیلوگرم، ۰/۴ کیلوگرم و ۰/۰۲ کیلوگرم بوده است.

نتیجه گیری: با توجه به ماهیت و میزان زباله دندانپزشکی تولید شده خصوصاً زباله عفونی و آثار نامطلوب آن بر روی سلامت مردم و محیط، اتخاذ یک سیاست مشخص جهت مدیریت مواد زائد جامد دندانپزشکی ضروری به نظر می رسد. همچنین با برگزاری کارگاه های آموزشی، آگاهی پرسنل مراکز درمانی دندانپزشکی در خصوص خطرات بالقوه آن افزایش خواهد یافت.

واژگان کلیدی: مواد زائد دندانپزشکی، دانشکده دندانپزشکی، بابل

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Introduction

Today, one of the many problems in the area of environmental health is medical wastes. These hazardous wastes include pathologic, chemical, radioactive, infectious and sharp wastes (1-3). Dental solid wastes are classified in the medical solid wastes based on type, dangerous potential, generation source and manner of management and other current parameters (4).

The main wastes of dental clinics are classified in three groups, including: 1-infectious and potentially infectious wastes, 2-chemical wastes and 3-general wastes or household- type wastes (2, 5). The generated infectious wastes of dental clinics, because of their importance and amount, are the most important dental solid wastes that include sharps, amalgams, and other contaminated materials with blood and other infectious liquids of body such as saliva, urine and excrement (6).

The infectious wastes or the potentially infectious wastes are the sharp objects like dentistry probes and drills, needle tips, needles, surgery blades and scalpels (4, 5). According to the studies, some of the medical centers and dental clinics around the world, almost 27% of the cuts made by dentists, nurses and surgeons are as a cause of using sharps (1, 2). Hazardous chemical wastes include waste of amalgam that has 49% of the toxic element of mercury; thus, it is accounted as hazardous wastes (7).

Half of the amalgam material contains mercury and the other half is alloy of silver, tin, copper, zinc and other metals (8). Integrated solid waste management in stages of generation, collection, storage, transportation and disposal of the dental solid wastes in keeping the health of the patients, personnel (dentists, nurses, and waste collecting workers) and other referees, is necessary (1,2).

Other hazardous wastes of dental clinics are X-ray films, leaden aprons and foils, and the expired chemical drugs (9). In this study, the quality and quantity of dental solid wastes generated from the different therapeutic and non-therapeutic centers of Babol Faculty of Dentistry are evaluated.

Methods

This study was done at the Faculty of Dentistry, Babol University of Medical Sciences. This Faculty has clinical Departments, including Pediatrics, Orthodontics, Endo, Repair, Surgery, Prosthesis, Perio, Para clinical units like Radiology and Diagnosis, Pathology and Laboratory, Non-therapeutic Departments, including service and administrative units.

The present study had been performed by census, in a way that the daily produced wastes of the therapeutic and non-therapeutic centers were collected and separated based on nature and potentiality hazards and also according to the recommendation of WHO and put them in special colored containers (1). This study lasted for one year, the generated wastes on three consecutive days (Monday, Tuesday and Wednesday) of the middle of the week from the second month of each season were examined.

Also, in this study, the dental solid wastes generated had been determined per capita of the wastes as kilogram for each dentistry unit. A Typical scale had been used for weighing the wastes. After three times of weighing them, the average of the weights was calculated and recorded in specific form. The plastic containers for collecting and separating the wastes of the therapeutic and non-therapeutic centers, the three types of wastes were separated and put in special colored containers (infectious and potentially infectious waste in orange plastic containers, hazardous chemical wastes in brown containers and general wastes in black plastics.

Tarpaulin gloves, jackboots, gowns, and special trousers were applied to analyze the wastes and vaccination against contact diseases like tetanus, Hepatitis B for the workers. The gross data were analyzed by SPSS Version 16. To analyze the data, parametric tests of one-way variance analysis and Kruskal-Wallis test were used. In here, the following components of dental solid waste were presented:

a. Infectious and potentially infectious waste Gloves (latex gloves used by dentists in dental practices) and Polyvinyl chloride (PVC) gloves used by dentists who are allergic to latex), blood-contaminated cotton and gauze, masks, dental impression materials including silicones, alginate, acrylics and Mercaptans, saliva ejectors, used anesthetic cartridges, extracted teeth, wax and removable appliances.

Although it was not expected to find disposable syringes, needles and sharps, these were recovered from the dental waste in all nine collections. Obviously, these components have come in contact with blood and other potentially infectious fluids of the mouth.

b. General solid waste (Domestic-type waste) Food waste, newspapers, tissue paper, textiles and cotton, dried gauze, correspondence envelopes, cardboard, plastic bags, disposable plastic glasses, paper sticks, tea waste, packaging materials, pens, matches, gypsum, styrofoam, sponges, gypsum and gauze mixture.

c. Hazardous chemical solid waste Amalgam contaminated paper, Amalgam contaminated gauze, Amalgam contaminated cotton, Radiographic films, Amalgam pieces, and lead shields from X-ray film packets.

Results

According to figure 1, the daily generated administrative solid wastes and clinical and paraclinical solid wastes of the Faculty of Dentistry-Babol were 101.5 kg/day (35%) and 190.1 kg/day (65%) respectively. In figure 2, general solid waste produced by administrative, clinical and para clinical departments has been presented. Based on this figure, general solid wastes generated by total departments of Babol Dentistry Faculty was 248.5 kg per day. In this study, general solid wastes generated by administrative and therapeutic centers were 98.4 kg (39 %) and 150.1 kg (61%) per day, respectively. Most of the general solid waste produced from therapeutic centers is related to laboratory and prosthesis units.

In table 1, the value of dental solid waste production in different departments is shown. According to this table, the most amounts of this generated waste is related to the administrative and laboratory wastes (35%, 17%). In table 1, the value of infectious solid waste generation is presented. The most amounts of this waste is related to Prosthesis (28%), Endodontic (15%) and Laboratory (13%) departments. In table 1, the value of hazardous chemical waste is showed. Based on this table, the most amounts of the produced hazardous chemical waste belong to Radiology (29%) and Prosthesis (19%) departments.

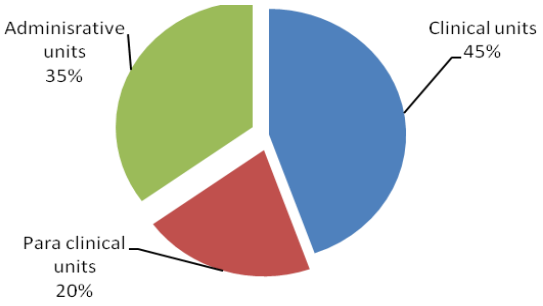


Figure 1. Dental solid waste production from the different units of Babol School of Dentistry

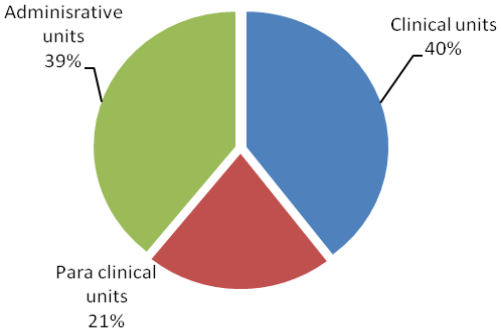


Figure 2. General solid waste production from the different units of Babol School of Dentistry

Table 1. Solid waste production in the different Departments of Babol School of Dentistry

Solid waste production (kg/day) Department	General Solid waste	Infectious Solid waste	Hazardous chemical Solid waste	Total Solid waste
Pedodontics	7.7	1.2	0.1	9
Orthodontics	16.3	2.1	0	18.4
Endodontics	14.6	6.2	0.2	21
Operative Dentistry	9.5	2.4	0.3	12.2
Oral&Maxillofacial Surgery	7.5	2.8	0.2	10.5
Prosthodontics	23	11.6	0.4	35
Periodontics	7.1	2.1	0.1	9.3
Laboratory	40.3	5.2	0	45.5
Oral&Maxillofacial Radiology	5.4	2.4	0.6	8.4
Oral Medicine	4.5	1.2	0.1	5.8
Pre clinic	14.2	0.4	0.03	14.6
Administrative	98.4	3.4	0.06	101.5
All Departments	**248.5**	**41**	**2.1**	**291.6**

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Discussion

The average of dental solid waste production in the Faculty of Dentistry-Babol was 291.6 kg in a day, that includes administrative wastes (101.5 kg/day, 35%) and clinical and paraclinical wastes (190.1 kg/day, 65%). Total waste generated by all departments of this faculty was 69888 kg in a year. The mean of waste generation in any department (12 departments) is 24.30 kg per day. In this study, the percentages of the general, infectious and chemical hazardous wastes were 85%, 14.3% and 0.7% respectively.

The average daily infectious waste generated by Babol dentistry faculty was 41 kg and 14.3% of the total dental wastes. The mean production of hazardous chemical waste in this research was 2.1 kg/day and 0.7% of the total solid wastes. In the research of Nabizadeh et al. in the field of dental solid waste produced by the clinics of Hamedan City, it showed that the production percentages of domestic-type, infectious and chemical wastes were 38.16, 51.93 and 9.4, respectively (10).

In a similar research by Kulivand et al. in Hamedan City, the quantity of domestic-type waste, infectious and potential infectious, chemical and toxic wastes in laboratory dentistry are 91.14%, 2.14%, 6.7% and 0.02%, respectively (11). Ghanbarian et al. investigated the area of quantity and quality of solid wastes produced by dental offices in Shahrood. In this study, the total annual dental waste generated by these facilities was 2425.5 kg, that the production of infectious, domestic-type waste, chemical and pharmaceutical and toxic wastes was 46%, 43.8%, 9.2% and 1%, respectively (12).

In research of Vieira et al. the quantity and quality of dental solid waste produced by three dental health services in several states of Brazil (one public and one private dental university and one public dental health service) were evaluated. In this research, the total amount of dental waste includes domestic-type, infectious and non-infectious wastes were 27.6%, 24.3%, and 48.1%, and respectively (13).In this study, general solid waste is actually domestic-type waste plus the non-infectious waste (27.6%+48.1%=75.7%) so, this result is similar to the general solid waste amount of this present research (85%).

Parandeh and et al. found that the rate of the generation of infectious waste was 38.42% of the total medical waste produced in Kerman Province (14), and this result is in contrast to our findings. According to results of this study, there is no proper separation of dental waste by classification based on the World Health Organization guidelines.

One of the basic reasons of increasing the infectious waste amount in the presented studies is the lack of solid waste separation in several medical and administrative departments. Al-Khatib et al. investigated the dental solid and hazardous waste management in Palestine (15).

In this study, infectious wastes constituted only 14.6 % of the total waste, thus, this result is close to our research. In the research Adedigba et al. in Nigeria, the average of infectious waste amount was 3.7% (16). Decreasing of generated dental solid wastes results to waste separation and recycling, hence, dental waste separation include infectious, general and chemical hazardous wastes in the total departments of Babol Faculty of Dentistry is performed.

The main reasons of the differences between the results of this project with the other presented researches can be due to the different classifications of dental solid wastes, different professional activities of personnel in the clinical and paraclinical departments and integrated solid waste management quality such as given the lack of solid waste separation and recycling. In the present study, the most production of infectious waste was related to Prosthesis (30%), Endodontic (17%) and laboratory (14%).

Also, the main dental sectors of toxic waste production include Radiology (30%), Prosthesis (20%) and Restorative (15%) departments. Graikos and et al, found that the infectious waste fraction (%w/w)of the hazardous medical solid waste in the clinical pathology laboratory, the X-ray laboratory, the surgery and injection therapy departments were 75.6%, 100%, 74.5% and 81,7%, respectively (17).

Considering the quality and quantity of the generated dental wastes especially infectious wastes and their unfavorable effects on the peoples' health and environment, it is necessary to compile a distinct policy for the management of dental solid wastes. Also, holding training workshops, knowledge of the staffs in the dentistry care centers should be increased to avoid possible dangers.

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Conflict of interest: There was no conflict of interest.

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