

Evaluation of dental waste management in two cities in Palestine

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تقييم إدارة نفايات عيادات طب الأسنان في مدينتين في فلسطين

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الخلاصة: دُرست طرق التخلص من نفايات عيادات طب الأسنان في 37 عيادة تم اختيارها بصورة عشوائية في مدينتي رام الله والبيرة، منها 31 عيادة من القطاع الخاص و6 عيادات تابعة لمؤسسات عامة أو منظمات لا حكومية. وسُئل أطباء الأسنان عن طرق التخلص من مختلف أنواع النفايات المتخلفة عن ممارسة طب الأسنان. فتبين أن المطهرات ومحاليل الأشعة السينية تُطرح جميعاً في بالوعات الصرف. أما بالنسبة للأدوات الحادة فكان يتم التخلص منها كما يلي: 13.5% من العيادات تستخدم صناديق غير قابلة للثقب (في عيادات المؤسسات العامة/ المنظمات اللاحكومية فقط)، و45.9% من العيادات تتخلص من الإبر مباشرة في القمامة بعد إعادة تغطيتها، و40.5% من العيادات تضع الإبر والشفرات في قوارير بلاستيكية تغلق قبل التخلص منها في النفايات العامة. وفي حين تم تطعيم 10.75% من أطباء الأسنان ضد فيروس الكبد "بي"، فإن 47% من العاملين في العيادات الخاصة لم يتلقوا هذا التطعيم.

ABSTRACT Disposal of dental waste was investigated at 37 randomly selected clinics in Ramallah and Al-Bireh cities: 31 private practices and 6 public/NGO clinics. Dentists were interviewed regarding their disposal of different forms of dental waste. Disinfectants and X-ray processing solution were thrown down the drain. For sharps, 13.5% of dentists used puncture-resistant containers (only in the public/NGO clinics), 45.9% discarded needles directly in the garbage after being recapped and 40.5% placed the used needles and blades in closed plastic bottles before throwing in the general garbage. Blood-soaked dressings and amalgam waste were also thrown in the garbage. While 10.75% of dentists were vaccinated against hepatitis B, 47% of the staff at private clinics were not.

Évaluation de la gestion des déchets dentaires dans deux villes de Palestine

RÉSUMÉ L'élimination des déchets dentaires a été examinée dans 37 dispensaires choisis au hasard dans les villes de Ramallah et d'Al-Bireh : 31 cabinets privés et 6 dispensaires publics/d'ONG. Les dentistes ont été interrogés en ce qui concerne la manière dont ils éliminent différentes formes de déchets dentaires. Les désinfectants et la solution pour le développement des radiographies étaient jetés dans les égouts. Pour les objets tranchants, 13,5 % des dentistes utilisaient des récipients résistants aux perforations (seulement dans les dispensaires publics et des ONG), 45,9 % jetaient les aiguilles directement à la poubelle après avoir remis le capuchon et 40,5 % plaçaient les aiguilles et les lames dans des bouteilles en plastique fermées avant de les jeter dans la poubelle générale. Les pansements imbibés de sang et les déchets d'amalgames étaient également jetés à la poubelle. Si 10,75 % des dentistes étaient vaccinés contre l'hépatite B, 47 % du personnel des dispensaires privés ne l'était pas.

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Introduction

Challenges arise in dealing with the considerable amount of health care waste that is generated by health care centres on a regular basis. About 20% of health care waste is considered hazardous and may pose grave threat to the surroundings [1]. Despite the fact that dental clinics are considered a minor source of health care waste [1], they nevertheless generate a certain amount of hazardous waste. The harmful effects of such waste cause serious human and environmental consequences if not dealt with properly. The common sources of major hazardous waste at dental clinics include X-ray fixer and film [2–4], chemical disinfectants [2,5–7], dental amalgam [8], sharps [9,10] and blood-soaked dressings [1,10,11].

There is no doubt that by following the environmental regulations that deal with different types of dental waste, the hazardous effects of such waste can be reduced or even eliminated. Minimizing the effects is strongly related to the behaviour of dental care professionals in their clinics. Many countries have aimed towards the elimination or minimization of the noxious effects of such waste. While several developed countries have established a comprehensive system for the management of health care wastes [12], developing countries still tend to suffer from improper waste disposal, insufficient financial resources, lack of awareness of health hazards and few data on health care waste generation and disposal.

In many areas of Palestine, dental waste along with other health care waste is often disposed of as part of the solid waste management system which is collected and dumped in uncontrolled landfills. Some local studies have investigated the generation and management of domestic solid wastes [13], a few have looked at the generation

of waste in hospitals [14] but none has addressed the issue of dental waste. In the absence of such studies and in the absence of regulations for medical waste disposal in Palestine, we investigated the handling and disposal of various types of dental waste generated on daily basis within the dental offices throughout the cities of Ramallah and Al-Bireh in the West Bank of Palestine.

Methods

Field visits to randomly selected dental clinics were carried out during the month of January 2002. We conducted structured interviews, lasting about 30 minutes, with the dentists using a pilot-tested questionnaire designed by us.

There were a total of 106 registered dental clinics in Ramallah and Al-Bireh district in 2001, distributed between public, nongovernmental organizations (NGO) and the private sector [15]. Of these, 94 were located within the borders of Ramallah and Al-Bireh cities: 86 of the 94 were private clinics and 8 belonged to public institutions or NGOs. The remaining 12 clinics were located in the rural areas. Our study focused on the clinics within the urban centres only because of the difficulty faced in reaching the rural areas due to Israeli military checkpoints that cut off Ramallah and Al-Bireh Cities from the rural surroundings.

The study sample included 37 dental clinics out of the 94 in Ramallah and Al-Bireh; 31 private clinics were randomly chosen from the 86 within the private sector and all 8 public clinics were included, since they were few. Each clinic only has 1 dentist. However, data could not be collected from 2 of the public clinics because the dentist serving 1 of the NGO clinics was abroad at the time of the study, and the other

clinic is run by UNRWA in Al-Jalazon refugee camp and this could not be reached due to the military checkpoint there. Both the dentists and the clinic were evaluated.

The first part of the questionnaire included data on type of clinic and hepatitis B vaccination status of the dentist and clinic staff. The last item was included because of the risks for health personnel who handle dental waste, especially sharps.

The second part of the questionnaire focused on the various types of waste generated by the dental clinics on a daily basis. Dentists were asked about the various types, concentrations and estimated amounts of disinfectants that they use in the dental clinic, and whether they follow the label instructions for the products on how to handle and discard the solutions. Furthermore, dentists who use X-ray units in their offices were asked about the handling and disposal of the processing solutions.

Sharps and blood-soaked dressings were addressed in the final section of the questionnaire. The questions focused on the presence of puncture-resistant containers in the clinics and the personnel in charge of their collection from the clinic. In addition, dentists were asked to estimate the average number of simple tooth extractions performed every week, as well as the average number of minor oral surgeries performed every month.

Data were entered and analysed with *SPSS*, version 11. Simple frequencies, means and cross-tables were used.

Results

Different types of disinfectants were used in the dental clinics. They included sodium hypochlorite (bleach), chlorhexidine, Cidex[®], phenols and ammonia compounds. Chlorhexidine, bleach and Dettol were the most commonly used disinfectants. The

concentration of the used chlorhexidine or bleach ranged from 0.05% to 5%. Dettol was used in diluted form. The amounts used varied between the clinics with a monthly average estimate of 1.17 L, 2.2 L and 0.6 L for the Dettol, chlorhexidine and bleach respectively. It was also found that high concentrations of chlorhexidine (> 1.5%) were used diluted with water.

We found 13 (35.1%) clinics used a disinfectant with the trade name Microten (Unident, Geneva). The chemical ingredients of this product were not given on the label, except that it contained ammonium compounds without mentioning the concentration. This product is used diluted with water in a proportion of 1:10. However, no instructions were written about its proper disposal. As regards disposal of disinfectants, all dentists and their assistants disposed of the used disinfectants down the drain.

About 21.6% of the private dentists had X-ray units in their clinics while only 1 of the public/NGO clinics had an X-ray unit. The number of X-rays performed each week by a single dentist ranged from 0 to 15 per week. All clinics used a single processing solution that had no mention of composition or concentration. The used material was disposed of in the drain in all clinics and the lead foil that shields the X-ray film was discarded in the regular garbage.

The majority of amalgam waste (87.9% of extra newly placed amalgam, 84.8% of non-contact amalgam) ended up in the garbage or drain posing considerable danger to the environment.

Puncture-resistant containers were found in most (4 out of 6) public/NGO clinics, while none of the private clinics had such a container. Thus, 45.9% of dentists disposed of sharps in the garbage and 40.5% placed needles in separate plastic bottles; 13.3% of these did not throw the needle-containing

bottles in the garbage, but themselves burnt them in a non-crowded area. In addition, 2 dentists reported that they also put the amalgam waste in the plastic bottles where they kept the used sharps. Table 1 shows the methods of sharps disposal.

Blood-soaked dressings, including gauze and cotton as well as the extracted teeth, are all placed in the garbage in all the clinics.

As regards vaccination against hepatitis B, 10.8% of dentists were not vaccinated and 47% of staff at private clinics were not vaccinated either; 12.5% of staff at public and NGO clinics were not vaccinated.

To obtain a rough estimate of the waste generated, dentists were asked to estimate the average number of needles used, and simple extractions and minor oral surgery carried out. The mean number of needles used by each dentist per month was 112. The average number of simple extractions per week was 15 teeth per dentist.

Discussion

The 37 randomly selected dental offices represented 39.4% of the total number of dental clinics (94) located within the boundaries of Ramallah and al-Bireh cities.

Our results show that the methods of disposal of dental waste are generally inadequate and expose dental staff and others to health risks and may contribute to environmental contamination.

Disposal of the diluted disinfectants was generally acceptable as the majority can be safely poured down the drain as was done by all the dentists. This is in line with the recommendations of different environmental agencies which agree on placing the frequently used disinfectants in dental offices like bleaches and alcohols in the sanitary sewer if their concentration is less than 10% [5]. However, 35.1% of the clinics used a disinfectant (Microten) of unknown composition and concentration and with no disposal information. Such products should not be used at all as they could be toxic or corrosive [1,5,7] and they should never be poured down the drain since they can produce hazardous effects once released within the wastewater.

This is also the case for dealing with the X-ray wastes, particularly the X-ray fixer which is a hazardous liquid. While globally disposal of such products is usually dealt with through recycling companies [2] or silver recovery units [4], no such solutions are available locally in Palestine and this leads to clinics simply discarding it in the drain.

Our findings indicate that the improper disposal of sharps, amalgam and blood-soaked dressings is widespread among the clinics as these items are discarded with the general garbage thereby jeopardizing the well-being of whoever deals with it. The lack of separate puncture-resistant containers in all the private clinics and the disposal of sharps in the general garbage, which is placed in badly controlled landfills in Ramallah city, will also lead to polluted surroundings and pose a risk of transmitting infectious diseases due to accidental injuries throughout the garbage disposal process. Indeed, there are reports of children being affected while playing with syringes that they found in uncontrolled dumping sites near their houses [16]. It should be noted

Table 1 Means of sharps disposal of the dentists

Disposal method	No. (n = 37)	%
Puncture-resistant container	5	13.5
Separate plastic bottle	15	40.5
Garbage	17	45.9

that other areas of Palestine such as Nablus city have experimented with incinerating sharps collected from hospitals [14,16] and such schemes could be extended to other areas.

Sharps are regarded as highly hazardous health care waste since they can cause injuries and puncture wounds [1,10]. The risk of disease transmission with bloodborne pathogens such as HIV, and hepatitis B and C is always present due to the exposure to contaminated sharps. According to the World Health Organization, many cases of infection with various pathogens are due to exposure to improperly managed health care waste, especially in developing countries [1]. For example, in 1992, 8 cases of HIV infection were recognized as occupational infections, 2 of which were parentally injured waste handlers [1].

While the majority of dentists in our sample had been vaccinated against hepatitis B, 47% of the staff at private clinics had not, which is alarming. Like any other health personnel, dental care professionals are at risk of infection from bloodborne pathogens. According to the US Environmental Protection Agency, the annual number of viral hepatitis B infections resulting from injuries from sharps among US dentists and dental assistants is < 1% and 5%–8% respectively [5]. Therefore, it is strongly recommended that hepatitis B vaccination be administered to all dental health care workers as well as others who deal with medical waste. Nevertheless, precautions

should always be taken since vaccinations are not yet available for other infectious diseases such as HIV and hepatitis C.

The generation of dental waste is escalating due to the increasing number of graduate dentists. The accumulated harmful effects of such hazardous waste pose a public health risk and urgent efforts are needed to address the issue of dental health waste disposal. In the absence of laws and regulations, there is no doubt that responsible disposal of waste within each dental clinic would reduce the heavy impact and would make a difference. For example, the placement of sharps in separate puncture-resistant containers may not entirely eliminate their harmful effect, but it would certainly minimize it considerably and all clinics should have and use such containers. Furthermore, the final disposal of sharps should be by incineration. Thus, awareness should be raised among dental care professionals regarding the proper disposal of dental waste and the health issues involved and they should be encouraged to follow safe procedures.

Our study has provided initial data on waste disposal in Palestine. It is hoped it will act as a stimulus for further in-depth investigations regarding dental and medical waste generation, handling and disposal in the local setting so that comprehensive data are available and crucial steps can be taken towards planning and implementing a sound medical waste management system throughout Palestine.

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