

## Medical waste management practices in Turkey: A case study in Sakarya

Mahmut Akbolat<sup>1</sup>, Cemile Dede<sup>2</sup>, Oguz Isik<sup>3</sup>, Hakan Saglam<sup>4</sup>

### ABSTRACT

**Objective:** To determine the knowledge levels of hospital administrators about the process of collection, temporary storage and delivery to the authorities about disposal of medical wastes.

**Methodology:** This descriptive study was conducted in Turkey in June 2010. Questionnaire technique was used as the data collection tool in the study. Data were analyzed using descriptive statistical methods. The results were assessed at significance level of  $p < 0.05$ .

**Results:** There was at least one manager responsible for waste management at each healthcare institution and all institutions had a medical waste management plan. Majority of institutions had a temporary storage for medical wastes. Genotoxic pharmaceutical chemical and heavy metal-containing wastes, as well as pressurized vessels were collected separately from other medical wastes. Average 1697 Kg medical waste per/day, and average 1.39 Kg medical waste per/bed were produced in healthcare institutions.

**Conclusion:** Effective medical waste management depends on active support of hospital administration and training of staff which are responsible for segregation, collection, storage, transportation and disposal of medical wastes.

**KEYWORDS:** Medical waste, Medical waste management, Hospital administrator.

Pak J Med Sci July - September 2011 Vol. 27 No. 4 892-895

### How to cite this article:

Akbolat M, Dede C, Isik O, Saglam H. Medical waste management practices in Turkey: A case study in Sakarya. Pak J Med Sci 2011;27(4):892-895

### INTRODUCTION

It is well known that hospitals, clinics, nursing homes, laboratories, veterinary clinics and many more establishments have to dispose of waste materials that have been generated in the process of medical care and treatment. They are also generated at other establishments related to medical care and treatment, such as general practitioner offices,

dental clinics, chiropractor offices, acupuncture, at-home patient care, and harm reduction programs for drug addicts and undertakers.<sup>1-3</sup> The waste generated from hospitals is now recognized as a serious problem that may have detrimental effects either on the environment or on human beings through direct or indirect contact.<sup>4</sup>

There is no single definition of medical waste, and thus, the terms medical waste, hospital waste, and infectious waste have often been used interchangeably.<sup>5</sup> But, any waste which consists wholly or partly of human or animal tissues, blood or body fluids, excretions, drugs or other pharmaceutical products, swabs or dressings or syringes, needles or other sharp instruments, being waste which unless rendered safe may prove hazardous (including microbial (infectious), pharmacological and/or physical [e.g. sharps] dangers) to any person coming into contact with it.<sup>1</sup> Although medical wastes represent a relatively small portion of the total waste generated in a community, medical waste management is considered an

1. Mahmut Akbolat, PhD,

2. Cemile Dede, MSc,

3. Oguz Isik, PhD,

4. Hakan Saglam,

Sakarya Provincial Health Directorate,  
Sakarya, Turkey.

1-3: Sakarya University Health Services Vocational School,  
Sakarya, Turkey.

Correspondence:

Mahmut Akbolat,  
Sakarya University, Saglik Hizmetleri Meslek Yuksekokulu,  
Serdivan Yolu Uzeri Sakarya, Turkey.  
E-mail: m.akbolat@gmail.com

\* Received for Publication: May 2, 2011

\* Accepted: June 16, 2011

important issue worldwide.<sup>6</sup> Many studies have focused on medical waste in countries such as the UK,<sup>1</sup> Jordan,<sup>2</sup> China,<sup>7</sup> Turkey,<sup>8</sup> Mongolia,<sup>9</sup> Egypt,<sup>10</sup> and Korea.<sup>11</sup> In many developed countries, specific rules and regulations have been implemented for hospital waste management systems and, thus, these systems are more effective than those in many developing countries.<sup>7</sup> Turkey, like most of the economically developing countries, has not emphasized the proper handling and disposal of healthcare wastes. Improper waste management is increasingly becoming a potential public health risk and an environmental burden.<sup>12</sup>

The management of healthcare wastes in Turkey is conducted according to the Turkish Medical Wastes Control Regulation that was adopted in 1993 and revised according to EU Environmental Directives in 2005. In the Regulation, the procedures about the classification of the wastes; collection, transportation, and temporary storage of the wastes within the institutions and their transportation to the final disposal area and the method of the disposal of the wastes were explained. According to Regulation, health care wastes are classified, based on its properties and the place of production, as: municipal wastes, medical wastes, hazardous wastes, and radioactive wastes.<sup>13</sup>

The purpose of this study was to determine the knowledge levels of hospital administrators about the process of collection, temporary storage and delivery to the authorities to disposal of medical wastes.

## METHODOLOGY

This descriptive study was conducted in Sakarya, which is a metropolitan municipality in Turkey in June 2010. Study included 116 hospital administrators that have been working in 9 state hospitals in Sakarya. A sampling wasn't selected in the study and the questionnaires were presented to all administrators.

However, questionnaire was administrated to 81 (69.8%) hospital administrators. Study started after receiving approval from related local authorities. Data were collected using the questionnaire that consists of 23 items prepared by researchers. The first 7 questions consisted of descriptive characteristics of the hospital administrators and the other questions intended to evaluate the practices for the collection of medical wastes at participants' own institutions. Data were analyzed using descriptive statistical methods (frequency, percentage, mean, standard deviation).

## RESULTS

The mean±SD age of hospital administrators (26-63 ages) was 40.17±8.229 and 61.8% of them were aged >36; their mean working time was (1-34 years) 11.15±7.272 and 33.3 % of them have been working for more than 15 years. 59.3% of the respondents of the study were males, 84.0% of them were married, 28.4% were head physicians/assistants, 46.9% were hospital directors/assistants, 24.7% were head nurses/assistants; 25.9% had associate degree, 35.8% had undergraduate degree, 29.6% had Master and doctorate degree (Table-I).

In the study, questions were asked about collection, storage and delivery to disposal areas of medical wastes. It revealed that medical wastes, infected wastes and domestic wastes were collected as separated and domestic wastes were shipped directly to the town refuse.

There was at least one person responsible for waste management at each healthcare institution, and managers in charge of waste management varied from institution to institution. While assistant head physician was responsible for waste management in some healthcare institutions, in some others hospital director, assistant hospital director, head nurse, assistant head nurse, nurse and even cleaning company employees looked after collection, storage and shipping for final disposal of medical wastes.

Table-I: Socio-demographic Characteristics of Participants.

Characteristics		n	%
Gender	Man	48	59.3
	Woman	33	40.7
Marital Status	Single or widowed	13	16.0
	Married	68	84.0
Age	<35	31	38.3
	36-45	25	30.9
	>46	25	30.9
Title	Head physician/assistant	23	28.4
	Hospital director/assistant	38	46.9
	Head nurse/assistant	20	24.7
Education level	High School	7	8.6
	Associate degree	21	25.9
	Undergraduate	29	35.8
	Master degree	6	7.4
Duty term (Year)	Doctorate	18	22.2
	<4 years	16	19.8
	5-9 years	18	22.2
	10-14 years	20	24.7
	15-19 years	15	18.5
	>20 years	12	14.8

Table-II: Health administrators' answers regarding properties of temporary medical waste store.

	Positive answer		Negative answer	
	n	%	n	%
It is kept locked entry and exit is prohibited except charged staff.	74	98.7	1	1.3
Medical wastes are stored through classifying in the temporary waste store.	69	92.0	6	8.0
Temporary waste store was built as closed, impermeable, non-porous structure.	63	84.0	12	16.0
There is special ventilation system.	59	78.7	16	21.3
It is delivered to metropolitan municipality teams after weight measurement once in maximum 48 hours.	53	70.7	22	29.3
Temperature is kept under control to prevent gas formation in the temporary waste store.	33	44.0	42	56.0

While 92.6% of participants stated that there is a temporary storage for medical wastes in their institution, 7.4% of them stated that they use medical waste container. They were asked whether temporary storage areas are appropriate to the required conditions or not in their institutions. As shown in Table-II, health administrators generally gave a positive answer except the expression that controlling the temperature to prevent the gas formation in the temporary waste store. Most of the responders (56.0%) gave negative answer to this item.

Majority (74.1%) of the responders showed that genotoxic wastes, pharmaceutical wastes, heavy metal-containing wastes, chemical wastes and pressurized vessels are collected separately from other medical wastes. According to health administrators medical wastes are collected separately, medical wastes are delivered to teams of municipal with a debit note (66.7%), are disposed in an incineration plant (8.3%), or are delivered to private institutions working in this field (23.3%).

All the participants reported that they have a medical waste management plan in their institution. According to the health administrators, responsible staff for medical wastes and their duties (81.5%), training of staff on medical wastes (80.2%), medical waste collection processes (79.0%), and delivering process of medical waste to municipalities (72.8%) are organized with this plan (Table-IV).

Average 1697 Kg medical wastes are produced in healthcare institutions in Sakarya. The average

amount of production of medical waste per bed/day is 1.39 Kg. Only three administrators stated that they had trouble about delivering of medical wastes to municipalities and two of them reported that they had problem especially during summer months due to late delivery of medical wastes, and the other participant didn't define the problem.

## DISCUSSION

Infectious waste materials need to be handled with careful consideration to prevent the spread of pathogens and to protect environmental health, in addition to being segregated from other waste materials.<sup>14</sup> In this study it was determined that infected medical wastes and domestic wastes are collected separately in all healthcare institutions and domestic wastes are shipped to town refuse directly.

According to results, at least one administrator was responsible for waste management in each healthcare institution. However, administrators in charge of waste management varied from institution to institution. Good management of health care waste in hospitals means the effective segregation of waste and the separate handling and disposal of each segregated waste category. This cannot be achieved without the commitment of senior directors and the motivation of medical and support staff.<sup>15</sup>

The amount of wastes from healthcare services in Turkey is a significant portion of the total waste generated, and therefore requires efficient management and control systems by specific regulations.<sup>9</sup>

Table-III: Disposal methods of genotoxic waste, pharmaceutical waste, containing heavy metal waste, chemical waste and pressure vessels.

	n	%
Medical wastes are delivered to teams of municipality with a voucher.	40	66.7
Medical wastes are disposed in an incineration plants.	5	8.3
Medical wastes are delivered to private institutions working in this field.	14	23.3
Unknown	1	1.7
Total	60	100.0

Table-IV: Organized Topics in Medical Waste Plans

	<i>Organized</i>		<i>Not organized</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Determination of responsible staff for medical waste and their duties	66	81.5	15	18.5
Training of staff on medical waste	65	80.2	16	19.8
Medical waste collection processes	64	79.0	17	21.0
Delivering process of medical wastes to municipalities	59	72.8	22	27.2

Healthcare organizations need to have waste management plans that should provide a solution to the waste problem, in a technically, environmentally, socially and economically sustainable way. According to results of this study, healthcare institutions have a waste management plan that consists of responsible staff for medical waste and their duties, training of staff about medical waste, collecting processes of medical wastes and delivering processes of medical wastes to municipalities.

Majority of healthcare organizations have temporary medical waste storages, only small healthcare instructions have been using medical waste containers. There was a consensus on responsible staff may enter to the medical waste storage area, medical wastes are collected as classified and delivered to municipal officials in a maximum of 48 hours, the temporary waste storage tanks was built as sealed and non-porous structure with special ventilation systems.

The generation mean of medical waste was 0.84 Kg bed/day in Egypt,<sup>4</sup> 0.88 Kg bed/day at local hospitals in Taiwan,<sup>6</sup> 0.28 Kg bed/day in Bangladesh.<sup>16</sup> Generated medical waste in inpatient facilities were between 0.03 to 0.14 Kg in Mongolia,<sup>9</sup> and average 0.68 Kg bed/day in China.<sup>7</sup> In teaching hospitals in Europe the generation rates were 3.9 Kg bed/day in Norway, 4.4 kg bed/day in Spain, 3.3 Kg bed/day in UK and France, while in maternity hospitals generation rates were 3.5 Kg bed/day in Spain, and 3 Kg bed/day in UK. It will be noted that the rates in both are approximately same.<sup>17</sup> According to this study, medical waste generation in Turkey (1.39 Kg bed/day) was between developed and developing countries.

In 2002, an on-line manifest system was established to manage medical waste with a high degree of reliability and in real time in Korea. All of the parties who register with the on-line manifest system can track the movement of the waste and find out the status of the waste in real time, saving energy, cost, and time to manage the waste.<sup>11</sup> A similar system can be installed to manage medical waste in Turkey and other countries.

## REFERENCES

1. Tudor TL, Barr SW, Gilg AW. Linking intended behavior and actions: A case study of healthcare waste management in the Cornwall NHS. *Resources Conservation and Recycling* 2007;51(1):1-23.
2. Fayez A, Qdais HA, Rabi A. Site investigation on medical waste management practices in northern Jordan. *Waste Management* 2008;28(2):450-458.
3. Pruss A., Giroult E, Rushbrook P. (edit) *Safe Management of Wastes from Healthcare Activities*. World Health Organization 1999; Geneva.
4. Abd El-Salam MM. Hospital waste management in El-Beheira Governorate, Egypt. *J Environmental Management* 2010;91(3):618-629.
5. Lee BK, Ellenbecker MJ, Moure-Eraso R. Analyses of the recycling potential of medical plastic wastes. *Waste Management* 2002;22(5):461-470.
6. Cheng YW, Sung FC, Yang Y, Lo YH, Chung YT, Li KC. Medical waste production at hospitals and associated factors. *Waste Management* 2009;29(1):440-444.
7. Yong Z, Gang X, Guanxing W, Tao Z, Dawei J, Medical waste management in China: A case study of Nanjing. *Waste Management* 2009;29(4):1376-1382.
8. Birpýnar ME, Bilgili MS, Erdogan T. Medical waste management in Turkey: A case study of Istanbul. *Waste Management* 2009;29(1):445-448.
9. Shinee E, Gombojav E, Nishimura A, Hamajima N, Ito K. Healthcare waste management in the capital city of Mongolia. *Waste Management* 2008;28(2):435-441.
10. Soliman SM, Ahmed AI. Overview of biomedical waste management in selected Governorates in Egypt: A pilot study. *Waste Management* 2007;27(12):1920-1923.
11. Jang YC, Lee C, Yoon OS, Kim H. Medical waste management in Korea. *J Environmental Management* 2006;80(2):107-115.
12. Alagoz AZ, Kocasoy G. Determination of the best appropriate management methods for the health-care wastes in Istanbul. *Waste Management* 2008;28(7):1227-1235.
13. Republic of Turkey Ministry of Environment and Forestry. *Medical Waste Control Regulation 2005*; Official Gazette No. 25883, Ankara, Turkey.
14. Miyazaki M, Une H. Infectious waste management in Japan: A revised regulation and a management process in medical institutions. *Waste Management* 2005;25(6):616-621.
15. Rushbrook P, Candace C, Gayton S. Starting healthcare waste management in medical institution, A practical approach. *World Health Organization Healthcare Waste Practical Information Series*. 2000; No. 1. Copenhagen.
16. Patwary MA, O'Hare WT, Street G, Elahi KM, Hossain SS, Sarker MH. Quantitative assessment of medical waste generation in the capital city of Bangladesh. *Waste Management* 2009;29(8):2392-2397.
17. Bdour A, Altrabsheh B, Hadadin N, Al-Shareif M. Assessment of medical wastes management practice. A case study of the northern part of Jordan. *Waste Management* 2007;27(6):746-759.