



## Original Article

## Hospital Waste Generation and Management Status in Rasht, North of Iran

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## ABSTRACT:

**Background:** We aimed to evaluate the quantity of waste generation and quality of hospital waste management among all hospitals in Rasht, North of Iran.**Methods:** In this hospital-based cross sectional study all 16 hospitals in city of Rasht were evaluated. The questionnaire included information about general characteristics of hospital, daily amount of hospital waste, and the structure of waste management. The mean generation of hospital wastes were calculated as per capita rate measured in kg per bed per day for different kinds of wastes.**Results:** The mean weight of total hospital waste was 4.46 kg/bed/day (95%CI: 3.32-5.59) including 2.76 kg/bed/day (95%CI: 2.02-3.51) general wastes and 1.69 kg/bed/day (95%CI: 1.14-2.24) hazardous wastes. The hazardous wastes comprised 36% of total hospital wastes. All hospital adhered to safe management of wastes including segregation (100%), equipment with treatment technologies (100%), having suitable temporal storage place (100%), and storage for less than 24 hours in temporal place (69%).**Conclusion:** The percentage of hazardous hospital waste was higher than estimated percentage by world health organization. Regarding to observing safe management of wastes in all hospitals, there is a need to give more attention to sustainable development of hospital wastes in the acquisition and use of resources.**Key words:** Hospital, Iran, Rasht, Waste Generation, Waste Management**Citation:** Shakiba M, Mohagheghian A. Hospital waste generation and management status in Rasht, north of Iran. Caspian J Health Res. 2018;3(1):20-23. doi:10.29252/cjhr.3.1.20

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## Introduction:

Despite of enormous advances in the field of medical and public health sciences, hospital waste management has been neglected in the development programs especially in developing countries (1). Hospital waste is generated in the process of diagnosis, treatment and immunization of patients. Because of spreading hazardous materials containing dangerous pathogen, hospital waste cause double-risk challenges to both environment and public health. According to

world health organization (WHO), about 15% of hospital waste is hazardous (2). Though, there is wide variety between and within countries in the amount of hazardous waste generation. For example in Ethiopia 62% of hospital waste is hazardous (3). In Iran, findings of the previous studies showed more hazardous waste generation than that of estimated by WHO being about half of the total hospital waste (4-7). This may be partly due to improper management of hospital waste. International Solid Waste Association (ISWA) provided useful recommendations

and guidelines for safe and sustainable management of health-care wastes including segregation, storage, transport, treatment and final disposal of health-care waste. (2). Furthermore, ISWA advocate proper attention to sustainable development in the acquisition and use of resources including minimizing resource use where possible, reusing appropriate medically items, maximizing of material recycling, and taking account of sustainable development issues in the management of wastes. To comply with the recommended guideline, first it is necessary that the hospital condition to be identified properly. Previous assessment of hospital waste among cities in Iran reported poor management of hospital waste (8-10). Rasht, the capital city of Guilan province, is one of the most crowded cities with high immigrant population in Iran. There is only one previous study in Rasht assessing only the quality of hospital waste management (11). Therefore, in this study we aimed to evaluate the quantity of hospital waste and quality of waste management among all hospitals in Rasht to make inform about current status of hospital waste generation and management for future evidence-based planning.

### Methods:

This is a hospital-based cross-sectional study to assess the waste generation rate and its management system in all hospitals of Rasht. Rasht is the capital city of Guilan province located at north of Iran with the total population of 956, 971(478, 678 males and 478, 293 females). There are 16 hospitals in Rasht including 11 public and 5 private hospital providing health facilities at second and third level of prevention. The study variables were gathered by filling a questionnaire. The questionnaire designed at three parts including general characteristics of hospital, daily amount of hospital waste, and the structure of waste management. According to a broad classification of WHO, hospital wastes were defined and categorized into hazardous and non-hazardous or general waste. Hazardous waste included infectious, chemicals, pharmaceuticals, sharps and pathological waste. Non-hazardous wastes were all remaining wastes that do not pose any particular hazard. The quality of waste management were assessed by questions including segregation of the waste, timing of waste collection, having temporal storage and its sanitary condition, duration of waste temporal storage, type of onsite transportation, treatment and disposal method, and personnel training. At each hospital the environmental healthcare staff interviewed and filled the questionnaire. The quantities of hospital waste were calculated as per capita rate measured in kg per bed per day (kg/bed/day) for different kinds of wastes. The mean amounts of waste by hospital activity were compared using t-test. Data were then analyzed using SPSS version 19.

### Results:

All 16 hospitals in Rasht city were evaluated in this study. Table 1 shows general characteristics and waste generation rate of hospitals labeled as A to P. The mean weight of total hospital waste was 4.46 kg/bed/day (95% CI: 3.32-5.59) including 4.53 kg/bed/day in public and 4.33 kg/bed/day in private hospitals. The minimum amount of total waste was 0.13 kg/ bed/ day and belonged to a public psychiatric hospital and the maximum amount was 9.05 kg/bed/day belonged to a specialized public hospital. The mean weight of hazardous waste including infectious, chemical and sharp wastes was 1.69 kg/bed/day (95% CI: 1.14-2.24) comprised 38% of total hospital waste. The mean amount of general waste was 2.76 kg/bed/day (95% CI: 2.02-3.51) comprising 62% of total hospital waste. Figure 1 illustrates the mean amount of hazardous and general waste according to the hospital dependency. There was no significant difference between private and public hospitals in the mean amount of hazardous and general waste.

In all hospital, waste items were segregated based on color coded bags as infectious or hazardous and general waste. Sharp waste collected in the safety box. Regarding to the timing of waste collection, in nine hospital (56.3%) waste were collected three times a day, two hospitals collected four times a day and remaining 5 hospitals collected once or twice a day. All hospitals had a temporal storage location with suitable sanitary condition. In 69% of hospitals the duration of temporal storage is less than 24 hours. All hospitals had facilities to treat their hazardous waste and disinfected them using autoclave (62%), hydroclave (38%), or dry heat method (6%). Excluding chemical waste, general and disinfected waste transported to municipality for disposal in landfill. The environmental health staff and the workers of all hospitals were trained about the health risks of sharp-related wastes and proper collection and transportation of hospital wastes.

### Discussion:

The findings of current study showed an average of 4.46 kg/bed/day in hospitals of Rasht that is among the highest hospital waste generated cities in Iran. The estimated waste generation was higher than the amount of previous study conducted in 13 provinces of Iran (12) and similar to the amount of waste generation in provinces of Tehran (13, 14), Alborz (4, 15, 16), Fars(17), Ardabil (18) and city of Kashan (19).

The reports of hospital waste studies in Iran showed a steady increase in the amount of total hospital waste from previous decade. For instance, the generation rates of hospital waste in West Azarbayjan (20), Mazandaran (21), and Boukan (22) were reported less than 2 kg/bed/day in the years of 2001 to 2007. While, the per capita amount of total hospital waste were more than 3 kg/bed/day in recent years (4, 5, 15, 16, 23).

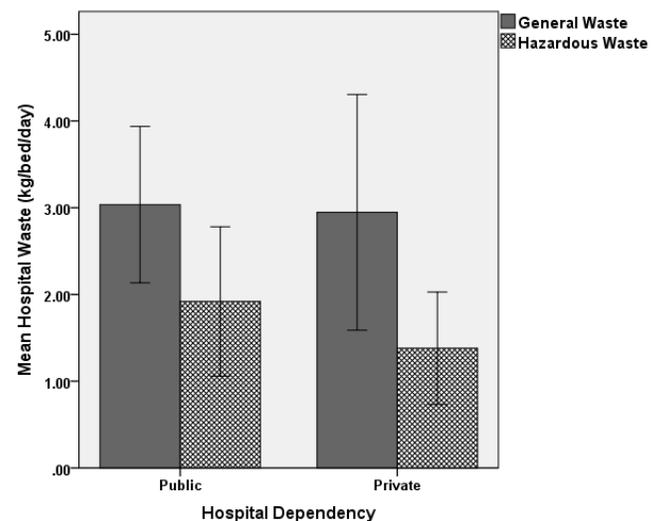
**Table 1.** General Characteristic and Waste Generation Rate in Hospitals of Rasht

Hospital	Dependency	Total bed	Active bed	Occupancy percentage	Hazardous waste (kg/bed/day)	General waste (kg/bed/day)	Total waste (kg/bed/day)
A	Private	120	120	100%	2.00	3.75	5.75
B	Public	64	64	100%	1.45	4.38	5.83
C	Public	105	62	59%	1.15	1.98	3.13
D	Private	200	200	100%	2.08	5.00	7.08
E	Private	60	38	63%	0.53	2.37	2.9
F	private	32	32	100%	0.85	1.25	2.10
G	Public	248	240	97%	0.01	0.13	0.14
H	Public	180	140	78%	1.29	2.86	4.14
I	Public	170	121	71%	1.69	3.45	5.14
J	Public	75	55	73%	3.45	1.27	4.73
K	Public	280	242	86%	4.09	4.96	9.05
L	Private	180	180	100%	1.46	2.39	3.84
M	Private	188	188	100%	1.40	2.93	4.32
N	Public	400	139	35%	1.22	1.58	2.81
O	Public	263	263	100%	2.72	3.80	6.52
P	Public	200	198	99%	1.71	2.12	3.84

Changing consumption pattern and higher frequent use of disposable materials have great impact on waste generation and the same challenge is happening for hospital waste. It is estimated that disposable products such as plastic surgery packs, paper and sterile cloth towels, food services, admission kit, etc. accounted for 85% of hospital medical equipment and can produce an immense quantity of total hospital wastes (24). In this study, Similar to most previous studies in Iran (4, 9, 10) and some developing countries (3), the percentage of hazardous hospital waste (38%) was higher than estimated percentage by world health organization (25). According to WHO, high-income and low-income countries generate on average 0.5 and 0.2 kg hazardous waste per bed per day, respectively (25). While, in this study the mean hazardous hospital waste was more than three times higher than estimated by WHO. Besides of the type of facility (i.e variety and extend of treatment and surgeries), the proportion of disposable to reusable materials is an important predictor of hazardous waste generation and can be considered as the source of variability among different hospitals (26). In fact it is estimated that 80 percent of hazardous waste comprised of recyclable or reusable materials (paper, cans, bottles, and packaging) that contaminated during hospitalization because of poor management (27, 28).

In this study all hospital adhered to safe management of hospital waste including segregation, frequency and type of onsite transportation, having temporal storage and equipped with treatment technologies according to WHO guidelines.

While, there may be lack of proper attention to sustainable development of hospital waste that is recommended by international agencies to reach the ultimate goal of reducing total waste. This may include minimizing resource use if possible, reusing items when appropriate medically, and maximizing the recycling of materials (2).

**Figure 1.** Hazardous and General Waste Generation Rate According to Hospital Dependency**Conclusion:**

The results of this study showed that total waste was 4.46 kg/bed/day and percentage of hazardous waste was 38% that is much higher than estimated values of WHO. Since there is suitable adherence to safe waste management among all hospitals in Rasht, the main focus should be on sustainable waste management including minimizing waste production and maximizing material recycling.

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**Ethical consideration**

Not Applicable

**Conflict of interests**

The authors declared no conflict of interest.

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