



# Journal of Applied Sciences

ISSN 1812-5654

**science**  
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## A Comprehensive Survey on the Present Status of Hospital Waste Management in Iran: A Case Study of Rasht

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**Abstract:** Health care waste management is considered as one of the critical task of any solid waste management program. In this research the current status of hospital wastes management in Rasht city which is the capital city of Gilan province with about 2.4 million populations, has been reviewed. The necessary data were collected through the questionnaire with 150 questions. The gathered data converted to the quantitative measure to evaluate the different management component. The results showed that in 83.33% the waste management rank was considered as poor. In 8.33% the waste management rank is very poor and in 8.33% the rank is medium. According to the results of this study, a comprehensive practical program should be initiated to improve the present status of hospital waste management in the city. The data of this research can be used as a baseline data for future monitoring of any hospital waste management program in the Rasht city.

**Key words:** Solid waste management, hospital waste, health care waste

### INTRODUCTION

Medical waste management is considered as one of the critical task of any solid waste management program in any urban development plan. Hospital waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields. It may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc. These are in the form of disposable syringes, swabs, bandages, body fluids, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner. Today, we can see that international organizations such as WHO look at these waste in a very wide range and mention it as Healthcare Waste (HCW) which is a by-product of healthcare that includes sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. According to some publications medical waste can be classified into two categories: general waste and special waste. These two types of waste are different in character and require specific waste treatment and disposal programs<sup>[1]</sup>.

It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infected<sup>[2]</sup>. According to the documents of World Health Organization (WHO), from the total of wastes generated by health-care activities, almost 75-90% are general waste comparable to domestic waste. The remaining of wastes is considered hazardous materials that may be infectious, toxic or radioactive<sup>[3]</sup>. Therefore waste separation should always be considered as an essential step in order to develop any cost-effective medical waste management practice.

According to the classification of World Health Organization, the health care wastes and by-products cover a diverse range of materials as seen in the following list<sup>[4]</sup>:

- Infectious wastes such as cultures and stocks of infectious agents, wastes from infected patients, wastes contaminated with blood and its derivatives, discarded diagnostic samples, infected animals from laboratories, and contaminated materials (swabs, bandages) and equipments.
- Anatomic wastes which are recognizable body parts and animal carcasses. Infectious and anatomic

wastes together represent the majority of the hazardous waste, up to 15% of the total waste from health-care activities<sup>[4]</sup>.

- Sharps which represent about 1% of the total waste from health-care activities<sup>[4]</sup>.
- Chemicals (solvents and disinfectants)
- Pharmaceuticals like expired, unused and contaminated; whether the drugs themselves or their metabolites, vaccines and sera. Chemicals and pharmaceuticals amount to about 3% of waste from health-care activities<sup>[4]</sup>.
- Genotoxic waste which are highly hazardous, mutagenic, teratogenic or carcinogenic.
- Radioactive matter.
- Wastes with high heavy metal content. Genotoxic waste, radioactive matter and heavy metal content represent about 1% of the total waste from health-care activities.

Rasht, the capital city of Gilan province, is one the most important cities of this region. This city is situated in a vast plain at a distance of 30 km from the Caspian Sea in the slopes of the northern Alborz Mountain Range. The climate of Rasht is humid and unstable. Dominant wind currents from the Caspian Sea blow northeast to southwest and annual precipitations are relatively high. The population of Rasht is estimated to be about 2.4 million. Final dispose place of either municipal solid wastes or hospital wastes of this city is Saravan landfill area which is located in 18 km from south of Rasht.

The major sources of health-care waste in Rasht are hospitals, since the most medical services are provided by these sectors. Therefore, optimum management of hospital wastes is considered as the principal and important part of environment protection in Rasht. Hence, regarding the importance of the subject, the goal of this research is to evaluate the current status of hospital wastes management in Rasht city. This research has been authorized by the ministry of health and covered all 12 hospitals in the city in order to set a comprehensive baseline data for optimizing the future hospital waste management and monitoring.

The main objective of this research was to assess the present status of hospital waste management in Rasht city to set a baseline to improve the hospital waste management in this city. Different components of a medical management system such as waste separation, temporary storage, waste collection, waste transportation and ultimate waste disposal have been reviewed.

## **MATERIALS AND METHODS**

In this research, 12 hospitals in Rasht city were investigated in order to evaluate the management

**Table 1: Hospital waste management ranking criteria**

Range	Rank
91-100	Excellent
71-90	Good
51-70	Medium
26-50	Poor
0-25	Very poor

process of hospital wastes. A questionnaire holding 150 questions was used to collect the data. It should be noted that questionnaires have been completed from Dec. 2004 to April 2005. The questions of the mentioned questionnaire were designed to cover the subjects of following categories in detail:

- Waste separation
- Waste collecting
- Temporary storage and maintenance of waste
- Waste transportation
- Waste disposal

To convert the collected data to a quantitative measure, score 1 assigned to questions which were compatible to the standards and score 0 was assigned to the questions which were not comply with standards. The standards were basically the available standards of the Ministry of Health which were based on the guidelines of WHO. Then in each category, scores were scaled up to set a quantitative measure from 0 to 100. The mentioned scaled up measures were used as the basis of descriptive statistical analysis. The measures of ranking the scores are presented in Table 1.

## **RESULTS AND DISCUSSION**

The results of computed scores for different hospital waste management components have been processed to reveal the current status of hospital waste management in Rasht city (Table 2).

According to the results of this study, the average and standard deviation of waste separation scores were 60.83 and 13.11, respectively (Table 3). Waste separation scores varied from 30 to 80. In 90% of cases, waste separation scores were equal or less than 77 and in 50% of cases, the scores were equal or less than 60. Distribution of waste separation scores in Rasht hospitals is presented in Fig.1.

The average and standard deviation of waste collection scores were 47.67 and 13.54, respectively (Table 3). Waste collection scores varied from 33 to 88. In 90% of cases, waste separation scores were equal or less than 78.1 and In 50% of cases, the scores were equal or less than 44. Distribution of Waste collection scores in Rasht hospitals is presented in Fig. 2.

Table 2: Computed scores of different hospital waste management components based on collected data through the completed questionnaires in twelve hospital of rasht city

Hospital codes	Waste separation scores	Waste collection scores	Waste transportation scores	Waste storage scores	Waste disposal scores	Overall waste management score
1	60	44	0	48	0	30
2	50	44	0	41	0	27
3	70	44	0	55	0	33
4	60	44	0	44	0	29
5	80	88	0	68	44	56
6	70	44	33	44	33	44
7	50	44	0	55	33	36
8	30	44	0	51	33	25
9	60	33	33	55	11	38
10	70	44	0	48	0	32
11	60	44	33	48	22	41
12	70	55	33	51	22	46

Table 3: Descriptive statistical analysis of computed scores of different hospital waste management components

Statistical parameters	Waste separation scores	Waste collection scores	Waste transportation scores	Waste storage scores	Waste disposal scores	Overall waste management score
No. Hospitals	12	12	12	12	12	12
Mean	60.83	47.67	11	50.67	16.5	36.42
Median	60	44	0	49.5	16.5	34.5
Std. Deviation	13.11	13.54	16.25	7.14	16.58	9.06
Variance	171.97	183.33	264	50.97	275	82.08
Range	50	55	33	27	44	31
Minimum	30	33	0	41	0	25
Maximum	80	88	33	68	44	56
Percentiles						
25	52.5	44	0	45	0	29.25
50	60	44	0	49.5	16.5	34.5
75	70	44	33	55	33	43.25
90	77	78.1	33	64.1	40.7	53

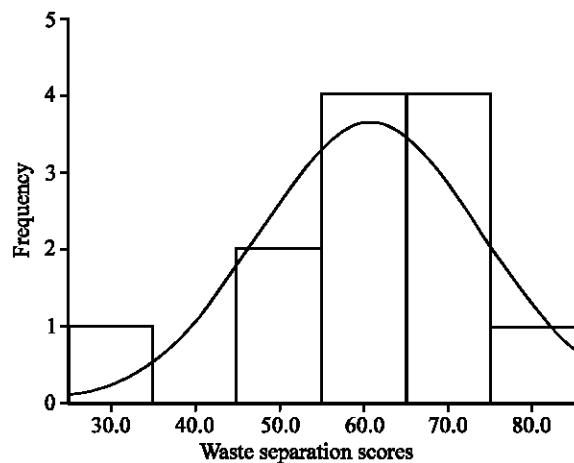


Fig. 1: Distribution of waste separation scores in Rasht hospitals

The average and standard deviation of waste transportation scores were 11 and 16.25, respectively (Table 3). Waste transportation scores varied from 0 to 33. In 90% of cases, waste separation scores were equal or less than 33. Distribution of waste transportation scores in Rasht hospitals is presented in Fig. 3.

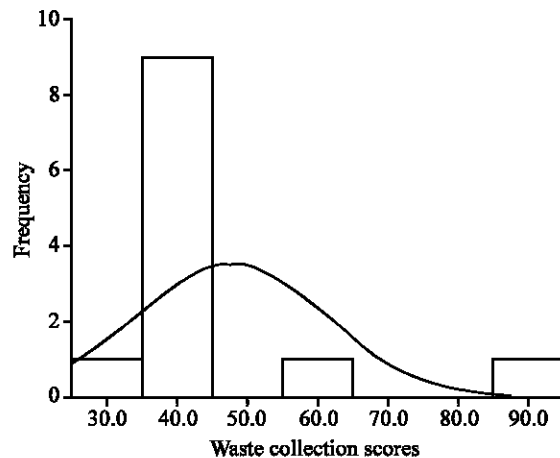


Fig. 2: Distribution of waste Collection Scores in Rasht hospitals

The average and standard deviation of waste storage scores were 50.67 and 7.14, respectively (Table 3). Waste storage scores varied from 41 to 68. In 90% of cases, waste storage scores were equal or less than 64.1 and in 50% of cases, the scores were equal or less than 49.5. Distribution of waste storage scores in Rasht hospitals is presented in Fig. 4.

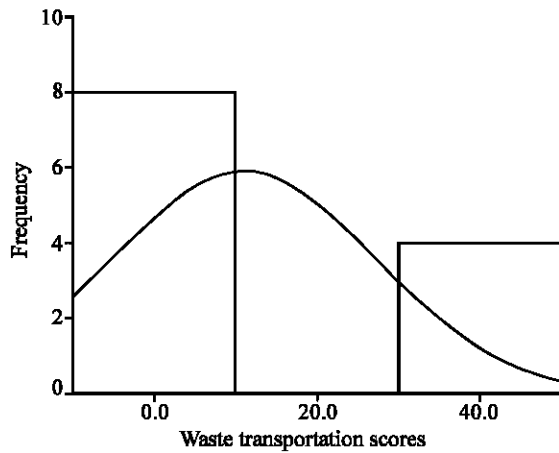


Fig. 3: Distribution of waste transportation scores in Rasht hospitals

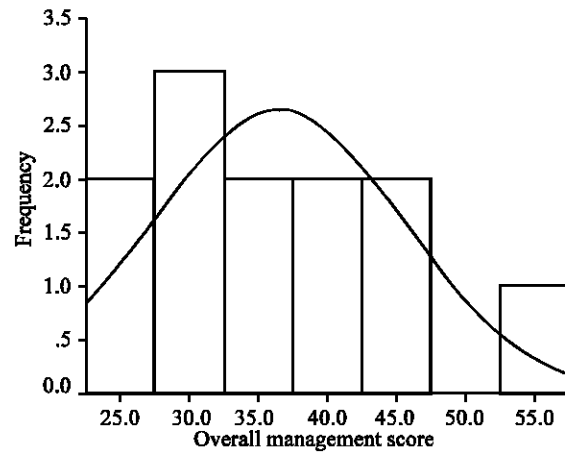


Fig. 6: Distribution of overall waste management scores in Rasht hospitals

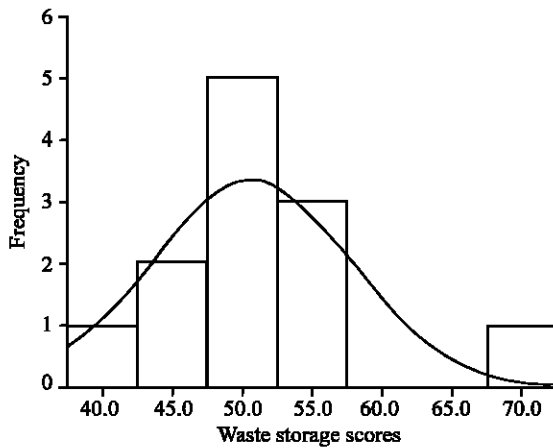


Fig. 4: Distribution of waste storage Scores in Rasht hospitals

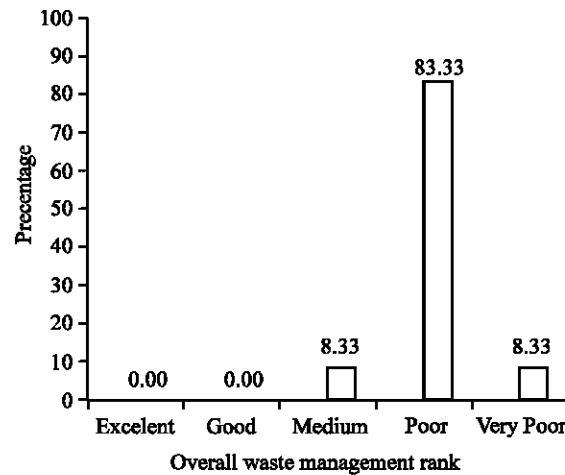


Fig. 7: Share of each waste management rank in this study

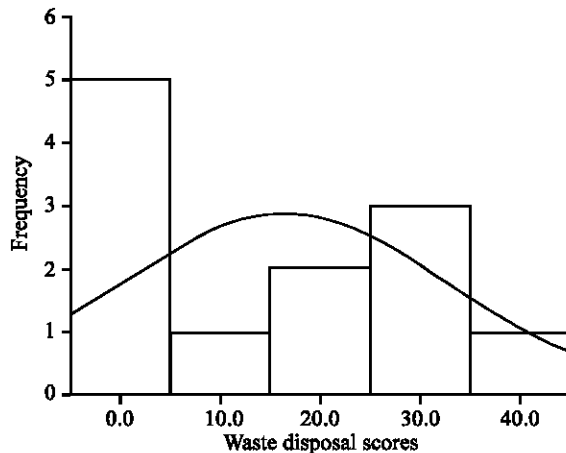


Fig. 5: Distribution of waste disposal scores in Rasht hospitals

The average and standard deviation of waste disposal scores were 16.5 and 16.58, respectively (Table 3). Waste disposal scores varied from 0 to 44. In 90% of cases, waste separation scores were equal or less than 40.7 and in 50% of cases, the scores were equal or less than 16.5. Distribution of waste disposal scores in Rasht hospitals is presented in Fig. 5.

The average and standard deviation of overall waste management scores were 36.42 and 9.06, respectively (Table 3). Overall waste management scores varied from 25 to 56. In 90% of cases, overall waste management scores were equal or less than 53 and in 50% of cases, the scores were equal or less than 34.5. Distribution of overall waste management scores in Rasht hospitals is presented in Fig. 6.

## CONCLUSIONS

As shown in Fig 7. in 83.33% the waste management rank was considered as poor. In 8.33% the waste management rank is very poor and in 8.33% the rank is medium.

The results showed that management process of hospital wastes is in a lower level compared to the standard of Ministry of Health and it has been approximately under average level. Therefore a comprehensive practical program should be initiated to improve the present status of hospital waste management in the city. The results of this research can be used as a baseline data to establish a management and monitoring program for hospital waste in Rasht city.

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