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STUDY ON SOLID WASTE COLLECTION AND DISPOSAL IN THE HOSPITALS AND HEALTH CARE CENTERS OF TEHRAN PROVINCE

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Abstract

The main objective of this investigation was to achieve a clear pattern of solid waste collection and disposal in selected hospital and health care establishments in certain cities of Tehran province. This study was done in more than 82 precent of all hospitals with 3017 beds during the year 1996.

Solid waste produced per bed was evaluated to be 2.87 kg per day which is very low , compared with 4.54 kg, in developed countries. Total Hospital solid waste was 8670 kg per day, for all beds, comprising less than 1% of the total solid waste generated in the same cities during the smae period.

According to the information gatherad in the 84.2% hospitals and health care centers, solid waste were collected manually by laborers from various sections. Detention time of the waste in 89.5% of the cases was nearly 24 hrs.

Densities of this type of waste were estimated to be 193.18 kg/m^3 with plastic bag and 247.72 kg/m^3 without bag. Physical analysis of the wastes indicated 15.1% plastic and rubbery, 9.6% linen, 12.45% paper and cardboard, 8.5% various types of metals, 1.7% glass and 52.4% other different materials.

In Iran, hospital administrations are directly responsible for collection transport and ultimate disposal of hospital wastes. Incinerators installed in 21.1% of the clinical centers, were not operating at all.

Overall conclusion is that, solid wastes collection transportation and disposal in Tehran district is not satisfactory, according to the health and management criteria.

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Introduction

The major aim of this research was to study the quantity and quality of wastes and situation of their collection and disposal in hospitals and health care centers of the studied zone.

Domestic, Industrial, hospital and health care centers solid wastes are now considered as a major dramatic problem in Tehran province with a high population density. Contribution of different sections of the society to the generation of total volume of solid wastes in Tehran are very different ; 85.7% corresponds to domestic ones; less than 3% to indusrial wastes; and nearly 0.83%, as estimated in this study, corresponds to the hospital and health care establishment activities. Although very low in quantity, hospital solid wastes may produce a great potential risk to the man's health and his environment (4).

In addition to the variety of hazardous bacteria and viruses, hospital wastes usually contain different sharp and cutting tools which is a source of drastic dangers (2). According to an investigation carreid out in Nigeria, 27% of annual injuries were happened due to such constituents (1).

Based on certain studies performed in U.S.A., 9.4% of the total hospital solid wastes comprise of different plastic and rubbery wastes mostly Poly-Vinyl-Chloride (P.V.C.) (3,7). Hospital solid wastes are classified in to two major categories; Ordinary or semi-domestic wastes and medical ones. The latter refer to solid wastes that is wholly or partly composed of living tissues, blood and its by-products, body secretions, drugs, contaminated cotton and cloths, syringes and similar materials.

Matrials and methods

Based on the preliminary information obtained from scientific literatures, a questionnaire containing 40 questions was prepared and distributed in 19 hospitals and health care centers to be filled by the responsible managers. 42.1% of those center were general and specialized hospitals and about 15.8% were maternity hospitals. Major data, extracted from the answers, were then analyzed by means of computer systems using (PE^2, and SPSS) softwares.

In order to obtain the physical specifications of such hospital solid wates , the major hospital in Karaj was choosed. The collected wastes were separated and each constituent was precisely weighed. A cylindrical container

with volume of 220 liters and a scale were used to determine the waste densities. To caluclate the weight percentages of the infectious solid wastes constituents, two hospitals were selected, in which such wastes were separately collected from their origin of production and classified according to Lieberman method.

Results

It is find that the per capital production of the solid wastes per each hospital bed is 2.87 kg/day in the Tehran province. In addition, the hospital and health care centers of this state generate 0.83% of the total solid wastes. Based on the total solid wastes produced in the two hospitals of Shahid Regaii and Quods, the infectious waste were 21.85% and 27.2% , respectively.

The physical analysis of the infectious waste of these two hospitals are given in tables 1 and 2.

Amoung the personnels empolyed in different units of the studied hospitals and health care units, 10.19% are involved in the process of waste collection and/or cleaning and sweeping the various units. During each working shift, wastes of averagely 23.73 beds are collected. Collection and transferring procedures were , in 84.2% hospitals, carried out manually by laborers, in 10.5% by means of wheelbarrow. Only in one hospital, ie. 5.3% an automatic system was employed.

It should be noted that the separation and classification of different constituents were not carried out the hospitals. Since such measures are highly singnificant from many points, of health , environmental, economical and technical views, various types of solid wastes generated by the main five different units and sections were percisely determined. Results are shown in table 3 according to W.H.O. (6).

Only 21% of the clinical centers were equiped with an incinerator, but none of them were efficient at the time of this investigation. The situation is shown in table 4.

Final step of this study was conducted to precise analyzing of the clinical waste constitutents. For this purpose Shahid Madani hospital in Karaj was choosed. The clinical solid wastes collected were analyzed phisically and compared with the similar data optained from the domestic waste analysis during the same time. Results are summorized in table 5.

Discussion

According to this investigation carried out in more than 82% of the hospitals and health care centers located at Karaj, Ghazvin, Ghom, Varamin and savojbolag cities, it was found that the per capita waste generation is 2.78% kg per day for each bed. This figure, thought widely variable in different conditions, is a significant health level criteria for various localities. For example, in more developed countries such as Norway, Spain and England, for education hospitals the amount rise to 3.9 , 4.4 and 3.3 kg for each bed per day respectively (5).

Deficiencies in the responsible organization, adequate training and economical aspects of management together with the lack of rules, regulations and guidelines have ultimately led to a dramatic situation of the clinical solid waste collection and disposal in the studied region.

Based on the information obtained, 94.7% of the temporary orderly bins for the waste collection are not constructed in accordance with the sanitary criteria. In addition , transportation of the solid wastes from such clinical centers is, in most cases, not acceptable from the environmental protection and safety points of view. In 78.9% of the cases, for instance, the mentioned clinices release their wastes with an appropriate separation of the dangerous infectious wastes from ordinary ones.

Because of the technical difficulties and relatively higher costs of , incineration systems are not usually used for waste disposals. The clinical waste are, there fore, colected and disposed by municipalities and just like the other wastes, they are finally transported to the particular sites for sanitary landfill.

Table 1- Weight percentage and amount of daily production of infectious solid wastes for each bed in Shahid Regaii hospital in Karaj.

Type of wastes	Weight Percentage	Amount of the waste Produced for each bed (Kg)
Isolated units	34.32	0.46
Culture media labs.	0.17	0.0002
Blood & related Units	0.29	0.003
Infectious & leb wastes	0.86	0.01
Sharp infectious wastes	1.44	0.014
Dialysis	28.6	0.38
Foods and other products wastes	34.32	0.47
Total	100	1.34

Table 2- Weight percentage and amount of infectious solid wastes for each bed day in Qudes hospital in Gazvin.

Type of wastes	Weight Percentage	Amount of the waste Produced for each bed (Kg)
Pathologic wastes	3.7	0.003
Sharp and cutting	3.7	0.003
Culture media	6.12	0.005
Blood & its by-product	36.8	0.03
Infectious lab. wastes	49.07	0.04
Biological wastes	0.061	0.0005
Total	100	0.0815

Table 3- Various waste generated by different section of clinical centers

Unit / Type of waste	Garbage	Radioactive waste	Chemical waste	Pathological waste	Infectious waste	Sharp & cutting waste	Drug waste	Pressure container
a. Clinical center: unit								
Curing	•		•	•	•	•	•	
Durgahore	•		•		•	•	•	
Vaccination & preventive medicine	•							
Admission	•							
Emergency	•		•		•	•	•	•
Patient records	•							
b. Paraclinical center								
Radiology	•	•	•		•	•	•	
Nuclear medicine & radiotherapy	•	•	•		•	•		
Physio Pathology	•							
Medical diagnosis lab.	•							
Blood bank	•							
Pathology	•			•				
c. Therapeutic of care center								
Bedridden rooms	•		•	•	•	•	•	
Surgury	•		•		•	•	•	
Child birth	•		•	•	•	•	•	
Physio-therapy	•							
Haemodialysis	•							
d. Office center								
Manager	•							
Dressing room	•							
Entrances	•							
e. Service & supplies department								
Laundry	•		•					
Central sterilization unit	•		•					
Kitchen	•		•					

Table 4- Distribution of absolute and relative frequencies of the clinical centers due to the conditions of incinerators.

Incinerator	Condition	Frequency	Percentage
With incinerator	Not applicable due to lack of accessories	2	10.5
	Not applicable due to the high air pollution	2	10.5
With incinerator	Lack of appropriate budget	4	21.1
	No site for installation	4	21.1
	Under consideration	1	5.3
	With no adequate reason	6	31.5
Total		19	100

Table 5 - Physical analysis and comparison of clinical and domestic solid wastes.

Constituents	Clinical solid wastes percentage by weight	Domestic solid wastes percentage by weight
Plastics	15.1	4.35
Cloths, cotton sterile bandage	9.6	-
Paper, paperboard	12.4	8.3
Metals	8.8	1.42
Glass	1.7	1.55
Others	52.4	73.52(mostly food wastes)

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