

ASSESSMENT OF HORMOZGAN PROVINCE ENVIRONMENTAL MANAGEMENT OF MEDICAL WASTES

Mohsen Dehghani^{1*}, Majid Vafadar², Saber Ghasemi¹

¹Department of the Environment, Islamic Azad University, Bandar Abbas Branch, Bandar Abbas, Iran

²MSc. Environmental Science, Hormozgan provincial directorate of Environment protection, Bandar Abbas, Iran

Corresponding authors: (Email: dehghani933@gmail.com)

ABSTRACT

Background: medical wastes have special importance because of having pollution and hazardous compositions for environment in solid wastes management system. One of the most fundamental elements in planning and implementing a correct medical wastes management program is being aware of quantitative and qualitative amounts of medical wastes. Method: this study which is a temporal descriptive type was done in 2009 to 2010 for examining medical wastes in Hormozgan province from qualitative and qualitative based on collecting data from 15 hospitals, field visits and sampling and analyzing results. Results: results showed that in studied hospitals 2556Kg medical waste is made per day. According to number of total occupied beds in studied hospitals, it shows every bed makes 83.1Kg medical waste that are infectious and hazardous wastes from 9.45 percent of this number. Conclusion: according to results of the study, management of hazardous medical wastes and destroying them is one of the worrisome and important problems of Hormozgan province that needs special attention of municipal planners and managers.

KEY WORDS: *Wastes, medical wastes, hazardous wastes, Hormozgan province*

Introduction

Along recent decades human activities and changes concerned with living methods and consumption pattern has triggered numerous mass of different types of waste (La Grega et al., 2001). These wastes are counted as a serious threat for human and other living creatures' survival. Hazardous wastes usually have one of these features: explosive, combustible, erosive, interactive or toxic and mostly is subcategorized in these categories: radioactive, chemical, combustible, biologic and explosive wastes (Albertoni et al, 1992; LaGrega et al., 2001). Hospitals, laboratories and medical research centers are main sources of biologic wastes. Collection, disposal or recycling technology of these materials are really different in comparison with municipal and domestic wastes, and this problem should be considered separately (Ropeik and Gray, 2002; Republic of Croatia, 2004). Recently World Health Organization has presented a relatively precise classification about medical wastes. We can point among them to general wastes, pathological wastes, radioactive wastes, chemical wastes, infectious wastes, pharmaceutical wastes and pressurized containers. Although a small portion of medical wastes are infectious and hazardous wastes but its incorrect way of management will cause environment, soil and weather pollution and

etc (Philip, 2003). In recent years, concern over clinical waste has increased throughout the world. Improper management of clinical waste poses a public health risk. Therefore, appropriate Clinical Waste Management (CWM) is a crucial issue for maintaining human and public health (Nema et al., 2011). Mixture of these wastes with domestic wastes not only endangers citizens' health by spreading infectious factors, rather it pollutes environments in landfills. Furthermore it makes impossible to recycle and process other wastes (Marinkovic et al, 2008). UN environment and development conference which was held in 1992 and caused to accept agenda 21, suggests a set of programs of waste management. A summary of those suggestions are:

- Prevent from producing wastes and reaching waste generation to minimum
- Reuse and recycle trash if possible
- Refining trash using an assured and reliable environmental way
- Dispose final remains using burial method in pit, fenced and precisely planned spaces

Also agenda 21 stresses that generators of trash are responsible for refining and disposing their own generated trashes finally, and every society has to bury its trashes inside its borders (Philip, 2003). The Clinical Waste Management practices cover all processes from the point of identification the wastes, to the place it is disposed in an incinerator. Initial handling, collecting, transporting, disposing and monitoring of waste materials are collectively called waste management. The primary objectives of waste management are reducing the amount and hazards of waste. Reusing the waste through the provision of secondary raw materials and use of the waste as energy resource are other objectives of waste management (Mochungong, 2011). In table 1 European countries approach towards hygienic-medical wastes is presented.

Table 1: portion of hygienic-medical wastes disposal methods (percent) in European countries

Method	Year		
	1993	2000	2010
Incineration	37.3	30	10
Combustion	25.5	35.6	46.6
Refining	11	10	48.6
Burying inside the earth	17	8.5	1.8
Reusing	4.3	5	7
Recycling	3.3	7.6	11
Prevent from generation	1.6	3.3	5

Methods

This temporal descriptive research was done from 2010 to 2011 in 15 hospitals of Hormozgan province (7 hospitals in Bandar Abbas and 8 other hospitals in Bastak, Parsian, Bandar-e-Lenge, Bandar-e-Khamir, Hajiabad, Rudan, Minab and Jask). In order to examine the condition of collecting, temporal storing, segregating trashes, final disposal, condition of training staff, condition of disposal and etc, standard questionnaire of ministry of health and treatment and field visits were used. This questionnaire includes general and specific questions like number of used

and infectious beds, number of staff, number of microbe tests, method of collecting, storing, transporting and disposing all types of medical wastes. For determining qualitative and quantitative amounts of generative wastes, sampling and analyzing all types of wastes were implemented monthly along a year. Since in each of the hospitals amount of generated wastes of units is different in each day of week, therefore for resolving this problem and attaining true information the operation was repeated three consecutive days and it was arranged to set one of those days visiting patients day. Quantitative amounts of total wastes, infectious, general (semi domestic) and sharp wastes was determined using weighing method by platform scale as exactness of $\pm 100g$. in order to determine qualitative condition of wastes simultaneously amounts of weight percent of plastic, paper and cupboard, fabric, glass, metals, nutritious wastes and etc. were analyzed in infectious and general wastes. During all the periods of study wastes density amounts were determined and recorded (WHO, 1999; WHO, 2001). Collected data were reported and analyzed using descriptive indicators.

Results

General results

Number of all the medical units in studied hospitals is 140 units. From all the 15 studied hospitals, 14 hospitals were administered by government and 1 hospital was private. Besides, there are 1734 beds in the hospitals concerned in this study out of which there are only 1394 beds which are active.

Collection and upkeep

According to the studies, 66.7 percent of the studied hospitals used plastic containers (plastic bags) and 33.3 of them used both plastic and steel containers in order to collect the waste. Temporary storage sites are not built based on a specific and constant pattern or standard in most of the hospitals. And as there is no appropriate cover, in many cases dangerous wastes are spread around because of rain and other climate factors.

Transportation

The present study indicates that 25 percent of these hospitals use covered trucks and 18 percent of them use covered pickups for transporting the waste. The medical waste is collected by municipality in 87 percent of hospitals and in the rest 13 percent; it is collected by the hired companies. 7 hospitals out of the 15 studied ones have got an incinerator which is active despite some problems such as smoking and loss of appropriate staff. And the other 8 hospitals haven't got any incinerator. Based on the surveys, all of the studied hospitals separate infectious waste from other solid waste. One should notice that none of the studied hospitals equipped appropriate procedures to exclude the waste.

Quantities

The results indicate that there is a 2556 (± 210) kg waste production in the studied hospitals which is approximately 1/83 (± 0.14) kg/bed/day and is much less than the average production rate in some of developed countries (4.5 kg/bed/day). Based on the studies, the average waste production rate in Persian Gulf hospital is the highest rate with 3.20 (± 0.21) kg/bed/day and that of Abalfazl

hospital of Minab is the lowest one with 1.25(±0.09) kg/bed/day.

Hospital Waste Composition

According to the results derived from this study, 45.9 percent of hospital waste in Hormozgan province is infectious waste, 53 percent of them is general waste and only 1/1 is sharp waste. Therefore, infectious waste rate of the province is 1788 (±136) kg/day. Sharp waste rate is 42.8 (±32) and general waste rate is estimated to be 2065 (±189) kg/day. Besides, based on the results the density of hospital waste is 302 kg/m³. The results out of recognizing and computing the percentage of components of hospital waste and waste composition rate is shown in Fig 1.

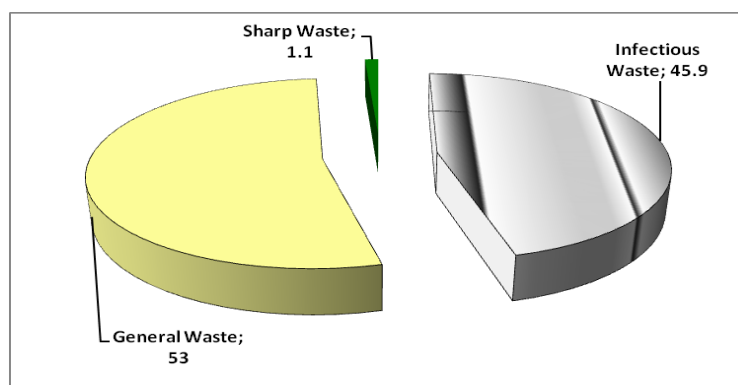


Figure 1: Waste generation rate (%) in Hormozgan Province

Waste Quality Analysis

According to the results of hospital waste study, nutrition and spoilable materials from 24.1 percent of hospital waste weight, paper 4.9, cloth 18.7, glass 1.5 and metals 2.6(Fig 2).

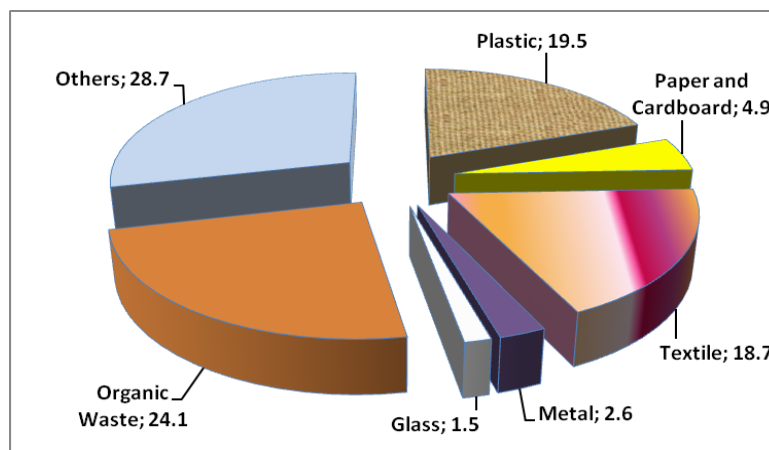


Figure 2: Non-Infected Medical Waste Composition in Hormozgan Province

Assessment

Based on the statistics revealed by medical science university of Hormozgan in 1389, the entire number of province's beds is 2129, which are spread in 22 medical institutes. Based so, regarding the computed rate, the entire weight of hospital, medical and sanitary waste of Hormozgan province is assessed to be 3896 kg/day. If the average rate of domestic waste production of Hormozgan province is 0.8 kg/day, then regarding the 1028190 population of Hormozgan, the entire waste production rate of the province will be 822000 tons. Considering how much the medical and hospital waste weighs in the presented study (3896 tons/day), then hospital waste is only 0.5 percent of the entire domestic waste. Therefore, the produced hospital waste in one year will be 1422 tons.

Table 2: The results of hospital waste analysis in Hormozgan province

<i>Parameter</i>	<i>mount</i>
Waste production rate in the studied hospitals	2356 (± 210) kg/bed/day
Entire hospital waste of Hormozgan Province	3896 (± 371) kg/bed/day
Average waste production rate	1.83 (± 0.14) kg/bed/day
Maximum waste production rate	3.29 (± 0.21) kg/bed/day
Minimum waste production rate	1.29 (± 0.09) kg/bed/day
Hospital waste percentage out of entire Domestic waste of province	0.5%
Infectious waste rate	1788 (± 136) kg/bed/day

Discussion

As the founding of the present study indicates, the hospital waste production rate is not only different in the studied hospitals but is also different from the rate of other cities of Iran and other countries. The cause of this difference is mostly depending on various factors such as waste management process, type of the hospital services serviced, number of active beds, cultural and economic conditions of society and so on (La Grega et al., 2001). Hospital waste rate had been changing between 2, 9 kg/bed/day in some of American hospitals. Eker and Bilgili showed that the average waste production rate in Turkey is about 2.11 - 3.83 (Eker and Bilgili, 2011).

Tsakona and colleagues results of study showed that average rate of medical wastes production in Greece is equivalent to 1.9 Kg in lieu of each bed in 24 hours which is similar to measured amount in Hormozgan hospitals (Tsakona et al., 2007). While in this research per head waste production in lieu of every bed is 1.83Kg in 24 hours, Yong-Chul Jang and his colleagues along a study project in Korea has reported medical wastes production per head amount 1.49Kg in lieu of each bed every 24 hours is less than measured amount in this research (Yong et al., 2006). In figure 3 average of produced medical wastes in Hormozgan province is compared with results of other

studies.

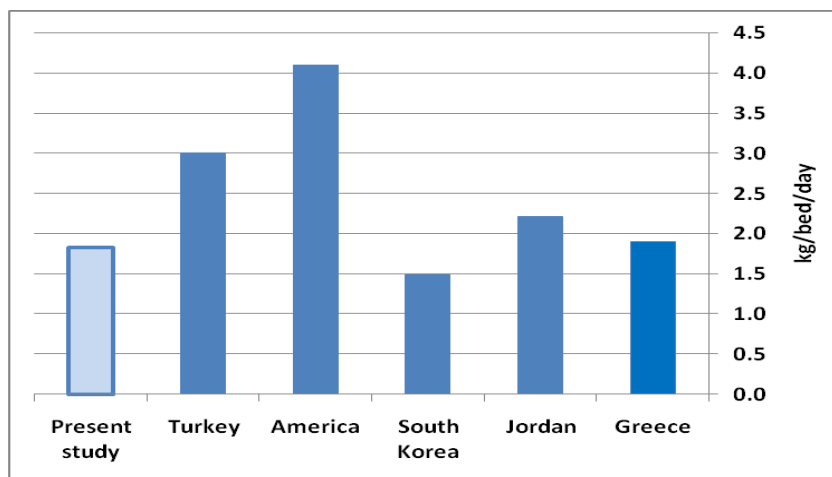


Figure 3: Comparison between Rate of Waste Generation and Hospital Waste in Different Country

In developing countries amount of 0.16 to 3Kg of each bed every 24 hours and infectious wastes are about 63 percent and between 0.01 to 0.65Kg in lieu of every bed every 24 hours (Diaz et al., 2008). Bazrafshan and his colleagues' amount of study results showed that among 14 active hospitals in Sistan and Baloochestan in 2008-2009, infectious, general and sharp wastes in order are equivalent to 45.9, 53 and 1.2 percent of total produced wastes. These statistics are presented while according to accomplished studies in other countries about 10 to 20 percent of total medical wastes are counted as infectious and hazardous wastes (Bazrafshan and Mostafa Pour, 2010). Motosso and his colleagues in management of medical wastes study Brazil showed that more than 50 percent of produced wastes are infectious (Mattoso and Schalch, 2001). Sawalem and his colleagues in Libya showed that 72 percent of studied medical wastes are general and 28 percent of them are hazardous while in this study hazardous wastes are counted 47 percent of total weight of wastes (Sawalem et al., 2009). By considering current problems in management department of medical wastes is always one of managers' and planners' main challenges, hence development, enhancement and amendment of this current condition is necessary. It seems problems which result from keeping trashes in temporal disposal locations, lack of segregation of wastes based on quality, lack of having incineration for all hospitals of Hormozgan, burying medical wastes and municipal wastes at the same place and lack of finding appropriate location for burying medical wastes of Hormozgan are the most important problems of wastes management that are needed to be take into consideration in order to reduce environmental and hygienic hazards.

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