



Research Article

Open Access  
 CODEN: IJBNHY  
 ISSN: 2278-778X

International Journal of Bioassays

## A survey on home generated medical wastes during Hajj event

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Received: 3/3/2018; Revised: 3/25/2018; Accepted: 3/27/2018

Available online: 3<sup>rd</sup> April 2018

**Abstract:** Medical waste is mainly generated from activities at health care facilities, but may also be generated at homes and crowded communities such as Hajj event (pilgrimage). In these cases, they would become harmful and threaten the health of pilgrims and visitors. The study was carried out to evaluate the knowledge, attitude, practice regarding home generated medical wastes among pilgrims and to estimate the prevalence of the most common types of these hazardous wastes during Hajj event in pilgrims' hotels. Questionnaire survey was conducted using a cross sectional design among a random sample population and the respondents were questioned about the types of medical waste they had generated. About 56% of the respondents had low knowledge about any awareness program related to home generated medical waste while 73.7% of them had positive attitude and were ready to respond to any orientation or educational program regarding medical waste management. The answers of participants varied regarding their hygienic practice towards medical wastes depending on the type of the medical waste; masks, bandages, residues of medicines and needles with ratio of 65.5%, 61.2%, 58.1% and 51.4%, respectively. The total home generated medical wastes during Hajj event were estimated to be 155.1 tons with a ratio of 14.1 tons/day and 6 g/pilgrim/day. 42.3% of these wastes were gloves, 16.6% were masks, 8.9% were medicines residues and 7.3% were gauze. The most common medicine residues were found to be glucose bottles (12.5%) and IV fluids (11.6%). It was concluded that Hajj pilgrims had positive attitude to respond to any orientation program. The rate of generation of home solid medical waste generated during Hajj is estimated to be high; therefore it is recommended that community awareness initiatives, educational and proper training programs should be launched among housekeepers and the residents of hotels and buildings on the safe methods of disposal of home generated medical wastes during seasons.

**Keywords:** Home, Medical wastes, Visitors, Pilgrims, Makkah, Hajj

### Introduction

Solid medical waste refers to any discarded solid material generated from activities at health care facilities [1]. The solid medical wastes are mainly generated at hospitals and health care facilities; they may be part of hazardous home waste especially at crowded areas such as pilgrims' buildings. They may also contain unwanted and/or expired drugs (prescribed and/or over the counter/OTC commercial drugs that have outreached their expiration date. Although The regulations regarding solid medical wastes disposal vary from country to country, for instance, in some countries, medical waste generated in hospitals and medical clinics by first rendering non-infectious through incineration, autoclaving or other treatment methods before disposal at any solid waste disposal area.

If the home generated medical waste is infectious, it should either be treated in a way that makes it no longer infectious or properly packaged to reduce the risk of exposing others to possible infection [2]. However, in many countries some hospitals still mixes municipal and hazardous wastes and do not separate them from

each other, instead, medical wastes are disposed as a municipal waste, i.e., not subject to any type of initial or final treatments [3-5]. The Hajj is one of the largest human gatherings in the world, attended by 2-3 million people each year. However, the crowded conditions at Hajj may increase the risk of accumulation of home generated medical wastes due to many factors: 1) crush injuries and stampedes due to the close contact with large numbers of people from around the world. 2) during shaving or haircutting, without follow health tips and instructions. 3) The use face-masks at crowded and congested places. 4) Frequent self-medication such as antibiotics abuse among pilgrims with chronic diseases [6-8].

Consequently, these health conditions may require the use of hypodermic needles, masks, gloves, syringes, lancets, etc., out of healthcare facilities.

Despite of their small quantities, home generated medical wastes may pose a significant risk to the health of residents and house keepers and become potential for disease transmission and environmental pollution. They may cause chronic or contagious infections such as hepatitis and AIDS among people who are exposed to them [9,10]. There is an urgent need for education,

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DOI: <http://dx.doi.org/10.21746/ijbio.2018.7.3.1>



knowledge, awareness among pilgrims, Makkah visitors and homeowners, about the hazardous of home generated medical wastes and about the safe disposal methods. In Makkah, several studies have been conducted on the study of solid waste management during the hajj seasons, but no single study discussed the management of hazardous medical wastes at pilgrim's accommodations during seasons. The study aimed to evaluate the knowledge, attitude, practice regarding home generated medical wastes among pilgrims, in addition to estimate the prevalence of the most common types of these hazardous wastes during Hajj season.

## Materials and Methods

The study was carried out in Makkah during Ramadan and hajj seasons 1438 H (May-September 2017). Questionnaire survey was conducted using a cross sectional design among a random sample population (449 respondent) during Ramadan 1438 (May-June 2017) to evaluate the pilgrim's knowledge and attitude about medical waste generated at pilgrims' buildings and their knowledge about disposal practices. The questionnaire was structured to find guest characteristics. Socio-demographic characteristics included age, gender, nationality, level of education. The questionnaire also included how

**Table 1:** Sociodemographic characteristics of survey respondents:

Number (%)	Variables	Number (%)	Variables
400 (89.1%)	Males	401 (89.1%)	Males
49 (10.9%)	Females	50 (10.9%)	Females
16 (3.6%)	<20	17 (3.6%)	<21
165 (36.7%)	21-40	166 (36.7%)	21-41
187 (41.7%)	41-60	188 (41.7%)	41-61
75 (16.7%)	61-80	76 (16.7%)	61-81
3 (0.7%)	>80	3 (0.7%)	>81
3 (0.7%)	Unknown	3 (0.7%)	Unknown
80 (17.8%)	Egyptian	81 (17.8%)	Egyptian
62 (13.8%)	Morocco	63 (13.8%)	Morocco
59 (13.1%)	Saudi	60 (13.1%)	Saudi
48 (10.7%)	Iraqi	49 (10.7%)	Iraqi
34 (7.6%)	Algerian	35 (7.6%)	Algerian
50 (11.1%)	Not educated	51 (11.1%)	Not educated
51 (11.4%)	Primary school	52 (11.4%)	Primary school
88 (19.6%)	Intermediate school	89 (19.6%)	Intermediate school
116 (25.8%)	Secondary school	117 (25.8%)	Secondary school
114 (25.4%)	Graduate	115 (25.4%)	Graduate
21 (4.7%)	Post graduate	22 (4.7%)	Post graduate
9 (2%)	No answer	10 (2%)	No answer
152 (33.9%)	Yes	153 (33.9%)	Yes
294 (65.5%)	No	295 (65.5%)	No
3 (0.7%)	No answer	4 (0.7%)	No answer
275 (61.2%)	In municipal waste container	276 (61.2%)	In municipal waste container
98 (21.8%)	In medical waste container	99 (21.8%)	In medical waste container
73 (16.3%)	I don't know	74 (16.3%)	I don't know
3 (0.7%)	No answer	3 (0.7%)	No answer
261 (58.1%)	In municipal waste container	262 (58.1%)	In municipal waste container
142 (31.6%)	In special medical waste container	143 (31.6%)	In special medical waste container
42 (9.4%)	I don't know	43 (9.4%)	I don't know
4 (0.9%)	No answer	5 (0.9%)	No answer
217 (48.3%)	Yes	217 (48.3%)	Yes
231 (51.4%)	No	232 (51.4%)	No
1 (0.2%)	No answer	2 (0.2%)	No answer
84 (18.7%)	Yes	85 (18.7%)	Yes
253 (56.3%)	No	254 (56.3%)	No
112 (24.9%)	No answer	113 (24.9%)	No answer
331 (73.7%)	Yes	332 (73.7%)	Yes
117 (26.1%)	No	118 (26.1%)	No
1 (0.2%)	No answer	2 (0.2%)	No answer

to dispose waste when generated at accommodation. In addition, respondents were questioned about the types of medical waste they generated. The language of communication was Arabic and English or the mother tongue where this was preferred. Also, the medical wastes produced in 53 hotels and buildings containing 12567 rooms occupied by 69324 pilgrims from 28 nationalities was sorted and measured through daily visit within five days during Hajj time and hence calculating the mean production per day. Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 22 for Windows software (SPSS Inc., Chicago, IL) and independent variables were evaluated using the Pearson's chi-squared.

**Results**

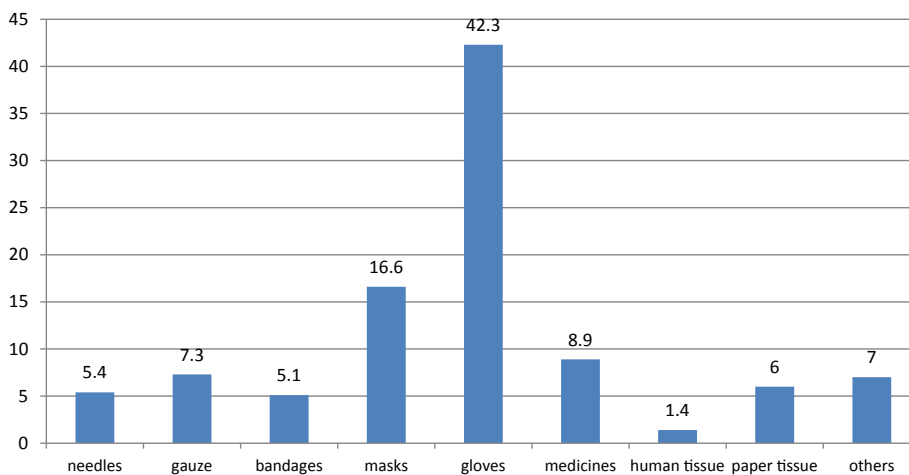
A total of 449 visitors were included in the survey. Respondents were predominantly males 400 (89.1%). The age categories are 40-60 years old 187 (41.6%), followed by 21-40 years old 165 (36.7%) (Table 1). Most of the respondents were with secondary and university level of education 118 (25.8%) and 116 (25.4%), respectively (Table 1). The highest nationality of the respondents was Egyptian, Morocco, Saudi, 80 (17.8%), 62 (13.8%) and 59 (13.1%), respectively. The answers of participants varied regarding their hygienic practice towards solid medical wastes depending on the type; masks, bandages, residues of medicines and needles with ratio of 294 (65.5%), 275 (61.2%), 261 (58.1%) and 231 (51.4%), respectively. About 253 (56.3%) of the respondents had low knowledge about any awareness program related to home generated medical waste while 331 (73.7%) of them had positive attitude and were ready to respond to the any orientation or educational program regarding medical waste management. Statically there was

significant relation between both age group and nationality with medical waste program awareness and also between nationality and method of disposal ( $p$  value<0.05). The amount of medical waste generated was found to be about 410 kg/day with a ratio of 6 g person/day. When considering the total number of pilgrims is 2352122 for 1438 (2017) season according to ministry of Hajj, Saudi Arabia, then the total ratio was estimated to be 14.1 tons per day and the total weight (in ton) was estimated 155.1 tons during Hajj when considering the mean time staying of each pilgrim is 11 days in Makkah. Of these, 42.3% were gloves, 16.6% were masks, 8.9% were medicines, 7.3% were gauze, while the lowest was tissue (1.4%) followed by bandages (5.1%) and needles (5.4%) as seen in Figure 1. The commonest waste of medicines residues were glucose bottles (12.5%) and IV fluids (11.6%) as seen in Figure 2. The most common nationalities generating medical waste were Bangladesh (16.3%), Egyptian (15.9%) and Iran (10.9%) as seen in Figure 3.

**Discussion**

Home generated solid medical wastes are considered as hazardous at crowded communities such as pilgrims buildings, especially those are accompanied with medical missions in addition to these wastes have a negative impact on hospital infection control programs and on health economics [11]. The results of the present study showed most pilgrims participated in the survey were males (89.1%). The lack of females in this study is contrary to some similar global studies, in which female participation rates was higher (68-70%) [1,12]. The explanation for this finding lies in the fact that the number of women in Umrah may be less than the number of men. The nature of the religious atmosphere makes the response of women to participate in the

**Ratio of each Type of medical waste in the study**



**Figure 1:** Ratio of each type of medical waste in the study.

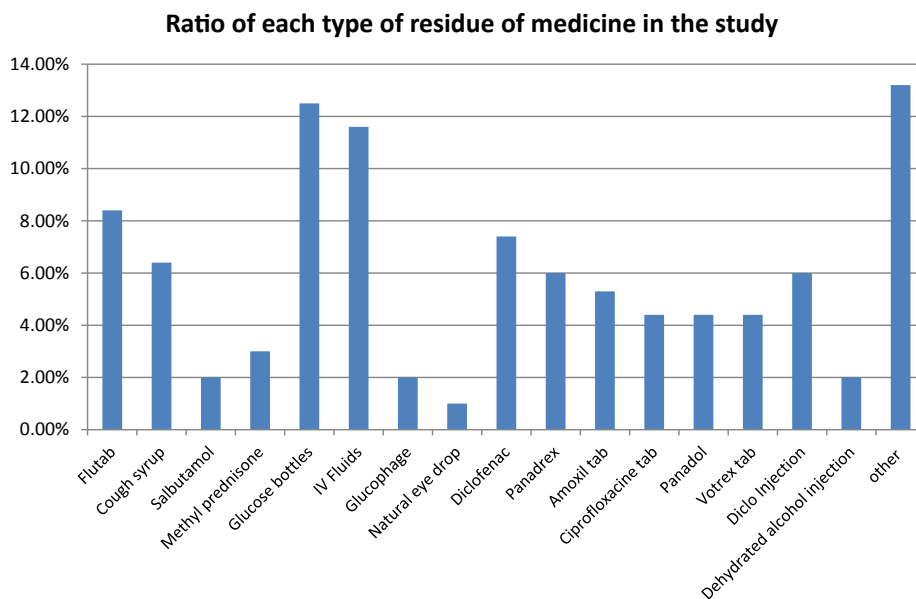


Figure 2: Ratio of each type of residue of medicine in the study.

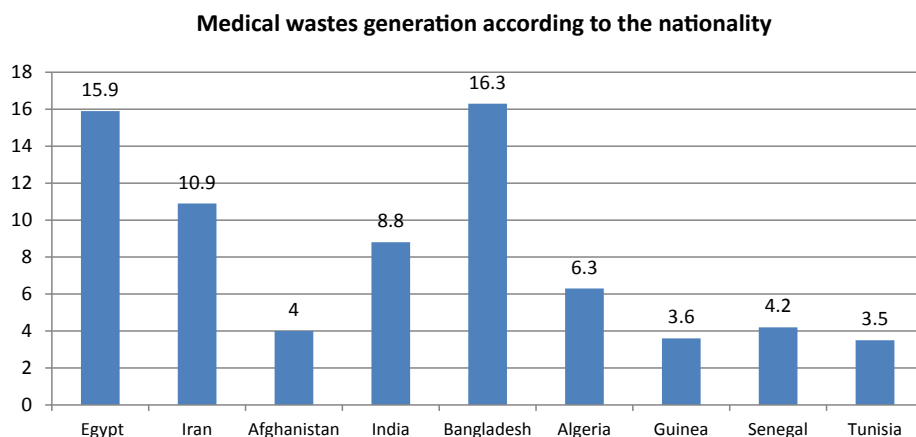


Figure 3: Medical wastes generation according to the nationality.

study very low. The most significant age groups that participated in this study were between 40-60 with 41.6%, followed by those aged 21-40 with 36.7%. Some studies have shown that the demand for Umrah from the Middle-Ages is more and more frequent, as this category is the keenest to perform Umrah and Hajj [13]. The present study showed that most of the Umrah pilgrims are among the categories of learners, where the ratios of secondary and university level (25.8%) and (25.4%), respectively. This result is close to Gulis and Fobil, 2017, [1] where the level of secondary education was predominant by 53.8% [1]. The current study shows that the most common participating nationalities were Egyptian, Moroccan, Saudi Arabia, Iraqi and Algerian: 17.8%, 13.8%, 13.1%, 10.7% and 7.6%, respectively. Also, Hajj pilgrims had mixed knowledge about proper disposal of masks, bandages, drug residues and needle residues in special medical waste containers by 65.5%, 61.2%, 58.1% and 51.4%, respectively. Also in this

study, knowledge about the home generated medical wastes was low as more than half of the participants (56.3%) didn't receive any training or awareness program about medical solid waste management while 73.7% of them had positive attitude and were ready to respond to the any orientation or educational program regarding medical waste management. There is an urgent and a continuing need for education on the appropriate knowledge of management of medical waste among pilgrims, residents, hospital workers, health care homes and school clinics on the mechanisms of how to dispose and segregate solid home generated medical wastes. This could be done via educational campaigns, Hajj tour groups, Islamic Associations, local mosques, Islamic youth centers and Islamic media such as religious websites and radio channels. There was a significant association between age and the method of getting rid of bandages wastes and the degree of awareness (p value <0.05), as well as a significant association between the nationality of the pilgrim

and methods of disposal of wastes ( $p$  value  $<0.05$ ). In the present study, the amount of medical waste generated during Hajj 1438H (2017) was estimated to be higher 14.1 tons per day and the total weight (in tons) was estimated 155.1 tons during Hajj which are disposed together with municipalities without following any treatment before disposal. The results of a similar study in Japan found that 38.8% of municipalities do not collect household medical waste at all, while 38.4% were “collecting all waste other than sharp objects” and 69.2% were “collecting all waste other than sharps and syringes” [3]. In Austria, Germany and Nigeria, household medical waste is disposed with municipal solid waste [14,15]. The present study showed that the commonest wastes were gloves (42.3%) followed by masks (16.6%) medicines (8.9%) gauze (7.3%). Despite their low proportion, many studies have shown several types of home medical waste [10,16]. Sharps household waste for some studies has been a major concern in homes and a source of infections among household waste, especially if they are randomly thrown. The present study showed that the most common types of medicine residues were glucose (12.5%) and intravenous solutions (11.6%). Several international studies have also indicated that expired medicines are most of domestic medical waste [17,18]. It has been shown that if medical waste is mixed with public waste, then the new wastes must be considered as harmful medical waste [19,20]. A study also suggested that household containers could be a potential risk for individuals or workers, especially if they contain sharp wastes [21]. The same hospital policies regarding solid waste management should be applied to homes, where a rigid puncture proof container for sharps and/or another waste container for contaminated wastes should be available. A study of home-generated medical waste in Mauritius showed that a large proportion of medical waste from the local environment had been integrated with local solid waste and ended up burying regular landfills [10]. It is necessary to implement of a national policy on the management of medical waste to educate the largest number of the people on the proper ways to manage the solid medical wastes and to control their hazard.

## Conclusion

In conclusion, Hajj pilgrims had positive attitude to respond to any orientation program. The rate of generation of home solid medical waste during Hajj is estimated to be high; therefore it is recommended that community awareness initiatives, educational and proper training programs should be launched among housekeepers and the residents of hotels

and buildings on the safe methods of disposal of home generated medical wastes during seasons.

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**Cite this article as:**

Abdullah Faisal Alsebaei. A survey on home generated medical wastes during Hajj event, KSA. *International Journal of Bioassays* 7.2 (2018) pp. 5606-5611.

**DOI:** <http://dx.doi.org/10.21746/ijbio.2018.7.3.1>