MEDICAL WASTE MANAGEMENT: A STUDY OF KNOWLEDGE, ATTITUDE AND PRACTICES AMONG PERSONNEL OF IMAM REZA EDUCATIONAL HOSPITAL IN KERMANSHAH

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Abstract

Medical waste management (MWM) has become significant importance for both the medical and general community due to effects of improper collection and disposal of wastes that make them as major threat for public health and the environment. Therefore, proper management of medical waste (MW) is not only a legal and official requirement but also a public responsibility for all hospital staffs. This work was conducted to investigate the knowledge, attitude and practices (KAP) among staffs who work in different sections of Imam Reza - hospital. The hospital based cross sectional study was conducted from March 2014 to September 2014 for all staffs who are dealing with MW. Data was collected by using valid questionnaire and interpretation was done by using percentages through Excel software. Furthermore, analytical study was performed by using correlation coefficient, and t-test through SPSS software version -20.

The results showed that the mean age was 33.24 years for 127 respondents with mean working experience of 8.49 years. Only 19.7% studied participants received training for MWM. Result conforms that only 33.9% of participants have adequate awareness of MWS, however an average of attitude was 25.42±5.77 %. Furthermore, more than 50 % of respondents had incorrect practices among all personals. Results pointed out the improper effects of inadequate knowledge about MWM that can influence the attitude and the practices of appropriate WM.

Key Words: Medical Waste, Management, Attitude, Practices, Hospital, Knowledge

1. Introduction

Nowadays, insufficient disposal of wastes from different sources is known as main risk for human health and environment (Sartaj and Arabgo 2015). According to Iran’s waste management law among different types of wastes, MW as solid,
fluid, or liquid include infected and harmful wastes, which produces from different medical centers during the diagnosis, treatment, or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological (2008). Majority of waste (75-90%) produced by the healthcare providers is non-risk or general and it is estimated that the remaining (10-25%) of healthcare waste is regarded as hazardous the potential for creating a variety of health problems (Krug 2008; Daou, Karam et al. 2015).

The medical hazardous waste include the blood-soaked bandages, culture dishes, medical sharps, instrument to inoculate cultures, organs and discarded lancets and etc. can be cause of difficult and different diseases like infectious bacterial fever (typhoid), fatal bacterial disease of the small intestine (cholera), viral hepatitis B and HIV infection (AIDS) (El-Salam 2010; Ferreira and Teixeira 2010; Dursun, Karsak et al. 2011). Based epidemiological studies at 2000 in the world, confirmed that waste-born disease was cause of 5.2 million deaths (including 4 million children) each year (Akter 2000).

Another important point is the high production rate of MW, which studies pointed out difference amount for countries; the total rate of medical waste in a developed country would be about 1.2 to 200 times more than developing countries (Maamari, Brandam et al. 2015). For instance, generation rates of infectious medical waste in Greece were found 1.4 kg bed−1 day−1 from 450 bed capacity (Komilis, Fouki et al. 2012) and generation of this waste in India about 0.5-2 kg bed−1 day−1 (Singh, Pratibha et al. 2014). Hospital waste rate for southern Iran was reported 2.43 kg bed−1 day−1 (Hadipour, Saffarian et al. 2014), while in Imam Reza hospital, as largest therapeutic educational center that located in west of Iran (Kermanshah), produce about 3.1 to 5 kg bed−1 day−1 of wastes; the amount of its ranges for infectious waste and non-infectious waste are 47.3% and 52.7%, respectively (Asadi, Mousavi et al. 2013). With this background, today’s medical waste is a big challenge in world particularly developing countries. Poor handling and improper disposal result to health hazard in countries. For example, contiguity with medical waste, which may be disposed mid domestic waste due to potential impact following health risk like pus, ulcer, hand cutting, became paralyzed and etc for municipal worker, then public health (Hakim, Mohsen et al. 2014). Improper handling of medical waste in the hospital can raise the air-borne pathogenic microorganisms, which could unfavorably effect the environment and public at large (Ferreira and Teixeira 2010; Graikos, Voudrias et al. 2010; Dursun, Karsak et al. 2011). Apart from the effect on environment, inadequate management of hospital waste illustrate instantaneous dangers for personnel and patients (infection Expanding) (Malini and Eshwar 2015). Therefore, to decline the improper effects of MW on hospital staffs and achieving high level of MWM
objects, training to improve their knowledge and subsequent changing their behavior to act based on waste management standards must be as first and important step. Study the knowledge, attitude and practices (KAP) of hospitals staffs with this fact that provide tool sake recognition the problems toward solution were main object of present research (Singh, Kishore et al. 2002). By KAP is possible to understand about knowledge’s persons on certain subjects, their feel about this subject in addition to each preconceived ideas and ways to demonstrate of knowledge and attitude by their action (Desa, Kadir et al. 2012). So the aim of this study as the first step in management system assess the knowledge, attitude and practices about different aspects of hospital waste management among hospital’s staff in direct to helps to find the best solutions for problems.

2. Material and Methods

2.1. Sampling

A cross-sectional study was conducted to investigate the level of knowledge, attitude and practice (KAP) about medical waste management among Imam Reza hospital staffs in 2014 at as the largest therapeutic educational hospital of Iran’s west part. This is a 515 bedded hospital with a work force of 1036 therapeutic personals and 441 maintenance and official staffs.

The sample size was calculated 127 persons using the equation 1 (Cochran 1977). In order to find the association between job title and satisfactory KAP scores, the sample was adjusted based preliminary study by filing questionnaire for 30 health- care personals that will be explained at next section. According to the proportion of health-care providers that come from 22 different part inside the study hospital including infectious part, Neonatal intensive care unit, Pediatric intensive care unit, oncology, laboratory, VIP (Very Important Person), surgery, emergency, maternity and so on.. The reason for this grouping is that similarity in job and generated waste A proportional weighted sample was taken as follows 9.4% doctor”, 36.2% nurse ”, 26% para-clinical and 28.3% official personnel ”which that participants were 127 (30 male (23.6%) and 97 female (76.4%) ).

\[ n = \frac{(z_{1-\alpha/2}^2 s^2)}{d^2} \]  

(1)

Where n= sample size, \( z_{1-\alpha/2} \)= Confidence interval, s= Standard deviation and d= Precision. Random sampling method for select of person was used and data was collected by interviewing respondents.
2.2. Questionnaire design

A pre-designed questionnaire included items about the socioeconomic and demographic information of participants (job title, age, sex, work experience and participate in WM course) was developed in Farsi language and was tested in a pilot study with 30 persons of different job titles (doctor, nurses and official staffs). The questionnaire was designed by using valid papers in this field toward waste materials (items listed by U.S. EPA) generated in hospitals (Agency 2012). Researchers and experts who work in field of environmental engineering investigated the validity of the questionnaire. The reliability of the questionnaire was studied by using Cronbach alpha (the average correlation between the items) coefficient. The Cronbach alpha 0.9 pointed out that this reliability is higher than 0.7 and confirm the high reliability of questionnaire. After achieving results for pre-designed questionnaire related to KAP included 4 sections namely; demographic information, personal knowledge, personal attitudes, and practices of personals that items were developed by the authors after reviewing similar published articles required changes were made and main questionnaire has been developed with 44 items. For demographic information section, 6 items were included, e.g. job title, age, sex, work experience and participate in WM course as well as on the diseases that can be transmitted by MW. The level of knowledge has been investigated through 13 items were included, e.g. on the field of policy and guidelines of medical waste management, waste characteristics, classification types, color-coded, collection containers, waste transfer methods, related diseases and health risks, proper disposal methods and responsibility. The positive or negative personnel’s attitude has been studied by applying 13 questions concerning medical waste management. Actual practices were assessed by a participant observation checklist (12 questions) concerning using personal protection equipment, correct disposal of sharps and other waste, hand-washing after injection, vaccination versus Hepatitis B diseases, segregation of hospital waste, and attendance in waste disposal management classes.

2.3. Statistical Analysis

Excel and SPSS (Statistical Package for Social Sciences, version 20) software were used for descriptive and analytical investigation of data. The KAP scores were calculated as follows: Knowledge and practices were scored 1 for answer “YES” and 0 for “NO” answer. The attitude’s question had four levels namely; strongly disagree, disagree, agree and strongly agree. The data were collected over a period of 2 months. To examine the relationship between the study variables (main variables) and KAP scores ANOVA test was used when P-values were considered insignificant at >0.05.
3. Results and discussion

The hospital personnel were chosen for the research considering the fact that these groups were more involved in medical waste generation, major contact with the waste and they are involved in its management than public. The mean age of respondents (n=127) was 33.24 years with mean work experience 8.49 years. A minority of respondents (19.7%) had participated hospital waste management training courses compared with (80.3%) of else. The first and important question of the questionnaire took into account the analysis of the level of awareness of the staff, by specific questions: “What diseases can be transmitted through the Hospital waste?” For this question, five diseases namely (Infectious Diseases, Hepatitis B, AIDZ, Typhoid Fever and Cholera) had enumerated that selectable number of respondents was as Figure 1, which 70.8% of the staff state 1 diseases.

![Fig. 1 Frequency of Responses regarding hospital waste-born disease.](image)

3.1. The level of Knowledge

Briefly, knowledge questions on topics such as take part in medical waste management courses, danger symbol, medical waste management categories, existence of policy regarding medical waste disposal, health hazard relevant with medical waste management, identify all colored bags for hospital waste collection and regular educational program were designed. In present study, only 33.9% of respondents had knowledge about MWM. Therefore majorities of healthcare personnel have intermediate (50.4%) to weak (15.7%) knowledge about waste management and its authorization and guidelines (Figure 2).

![Fig. 2 Frequency of Responses regarding hospital waste management and knowledge of regulations.](image)
To examine the relationship between the participants' awareness with their job was used ANOVA, which showed a significant relationship between the knowledge of participants with jobs (P-value <0.05). It also indicated that majority of hospital personnel including doctor, nurses and official staffs had similar awareness about medical waste and management of it as well as just Para-clinical department had relatively lower awareness in this field (Table 1). In this study, the relationship between participants age and the level of their knowledge have been investigated that results in (Table 2) pointed out a significant relationship (P-value<0.05) with the Pearson correlation coefficient (r=0.291). There is significant relationship between knowledge and Gender of respondents (P-value <0.05). A significant relationship indicated between the knowledge of participants who have participated in training courses for hospital waste management and those who have not taken this period (P-value <0.05).

Came to the conclusion of studies almost whole the subjects agreed to the indisputably fact that exposure to medical hazardous waste can lead to disease or infection (Kapoor, Nirola et al. 2014). Therefore, this shows that training is essential for staff, while the 80.3% of staffs have not taken these courses. These results are in agreement with the study conducted by Kishore et al (1999) that revealed lack of knowledge in conjunction with medical waste management and handling (Kishore, Goel et al. 1999).

Comparison was made for awareness about hospital waste management and its role among different categories (Table 3). Significant relationship between of categories that take part in medical waste management courses and those who did not participate in this course (P-value<0.000), and awareness about all methods for medical waste management as compared based gender (p-value=0.699).

**Table-1: Mean ± SD scores of individual’s knowledge, attitude and practices.**

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Mean ± SD</th>
<th>Mean ± SD</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>knowledge</td>
<td>attitude</td>
<td>practices</td>
</tr>
<tr>
<td>Divided to Job</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctor</td>
<td>12</td>
<td>7.08±3.34</td>
<td>24.5±5.09</td>
<td>6.25±3.72</td>
</tr>
<tr>
<td>Nurse</td>
<td>46</td>
<td>7.8±3.19</td>
<td>25±5.59</td>
<td>7.24±2.24</td>
</tr>
<tr>
<td>Para-clinical</td>
<td>33</td>
<td>6.88±2.96</td>
<td>25.57±6.5</td>
<td>6.58±1.8</td>
</tr>
<tr>
<td>department</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Official department</td>
<td>36</td>
<td>7.53±2.47</td>
<td>26.11±5.4</td>
<td>6.03±2.99</td>
</tr>
</tbody>
</table>
Table-2: Correlation between variables with knowledge.

<table>
<thead>
<tr>
<th>Subject</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.291</td>
<td>0.001</td>
</tr>
<tr>
<td>Work Experience</td>
<td>0.193</td>
<td>0.031</td>
</tr>
</tbody>
</table>

Table-3: Comparison between awareness, attitude and practices divided variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>T-Value</th>
<th>df</th>
<th>Mean Difference</th>
<th>Standard Error</th>
<th>P-value</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness divided to gender</td>
<td>0.387</td>
<td>125</td>
<td>0.239</td>
<td>0.617</td>
<td>0.699</td>
<td>1.461 -0.983</td>
</tr>
<tr>
<td>Awareness divided to take part to MWM course</td>
<td>5.016</td>
<td>120</td>
<td>3.069</td>
<td>0.612</td>
<td>0.000</td>
<td>4.28 1.857</td>
</tr>
<tr>
<td>Attitude divided to gender</td>
<td>1.435</td>
<td>125</td>
<td>1.723</td>
<td>1.2</td>
<td>0.154</td>
<td>4.1 -0.654</td>
</tr>
<tr>
<td>Attitude divided to take part to MWM course</td>
<td>1.896</td>
<td>120</td>
<td>2.47</td>
<td>1.303</td>
<td>0.06</td>
<td>5.05 -0.11</td>
</tr>
<tr>
<td>Practices divided to gender</td>
<td>-1.59</td>
<td>125</td>
<td>-0.868</td>
<td>0.546</td>
<td>0.114</td>
<td>0.212 -1.949</td>
</tr>
<tr>
<td>Practices divided to take part to MWM course</td>
<td>3.082</td>
<td>120</td>
<td>1.787</td>
<td>0.58</td>
<td>0.003</td>
<td>2.936 0.639</td>
</tr>
</tbody>
</table>
3.2. The level of attitude

The investigation on the level of attitude that was based on 13 questions was well-responded by all the healthcare personnel and about 86.6% of all participates were aware about responsibility of hospital managers and government, importance of source reduction and segregation of waste and cooperation in waste management as a team work not hospital responsibility. The result indicated that the most of respondents were in agreement with the aspects associated with MWM. The majority of the whole personnel showed a positive attitude with an average (25.42±5.77) towards hospital waste management particularly hazardous part and supported the in progress efforts (Table 4). This finding supported Narang et al (2012) study in respect of medical waste management with a highly significant difference in the dentists (p-value<0.001) (Narang, Manchanda et al. 2012). We found a statistically significant association between attitude and age with r=0.21 (P-value<0.014). Also, according to Table 4 there is a significant relationship between attitude and work experience (P-value <0.033) and Pearson value of it was 0.19. One could say that persons with more job experience to have a better attitude toward hospital waste management and they are well known aware related to deficiency and shortcomings of management in addition its strengths in hospital. Also using independent samples t-test found that there is no statistically significant correlation (P-value<0.05) between variables gender (men and women’s attitude) and job (p-value=0.78). This results conformity by Pandit et al (2005) study, that revealed a positive attitude in the nurses and the housekeeping staff with 98% - 79%, respectively, and only 41% of the technical staff had a negative attitude (Pandit, Mehta et al. 2005). The most important results derived from Lakbala et al (2013) indicated a significant (P-value<0.05) relationship between the level of education achievements to positive attitude creation in hospital waste management (Lakbala and Lakbala 2013). Indeed, 19.9% members of official’s staff and 32.2% members of staff from others part like NICU, VIP and so on, had the same opinion about hospital waste management in not only government's obligation and everyone must be shared with his proper behavior (Lakbala and Lakbala 2013).

Table-4: Frequency and correlation between various parameters for attitude of staff.

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Mean ± SD</th>
<th>Frequency</th>
<th>Correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>26.73 ± 4.38</td>
<td>30</td>
<td>r</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>25.01 ± 6.1</td>
<td>97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25.42 ± 5.77</td>
<td>127</td>
<td>Age 0.218</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>--------------------------</td>
<td>-------</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Trained individuals</td>
<td>27.54</td>
<td>5.77</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Don’t Trained individuals</td>
<td>25.01</td>
<td>5.70</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26.27</td>
<td>5.73</td>
<td>127</td>
<td></td>
</tr>
</tbody>
</table>

### 3.3. The level of practices

This study indicated that more than 50% of the respondents had incorrect practices regarding hospital waste management. The results pointed out that 7.24% ±2.24 of nurses had suitable practices for questions practices related to segregation of waste at the point of generation by the color coding. On the other hand, it was surprising that all staff in all categories had knowledge and positive attitude about MWM but their practices comparatively were not satisfactory. This may be because they would have the good knowledge and positive attitude concerning hospital waste management as they are recently gave their examination, but regard the practices is not interesting because less practical exposure. With the findings in our study determined a significant relationship between practices and age of the respondents does not exist (p-value>0.05). However, we suspected that age increasing due to appropriate practices. Addition, there is no significant relationship between practices and job experience (P-value<0.05). Correlation coefficient for this relationship was (r= -0.003), indicating they who have high work experience have higher skill and abilities which this has led them to believe that the danger does not threaten them because they have more skills. The hospital waste pollution for personnel in hospital is considered a major threat and everyone should be aware of the risks. So it is necessary, everyone should follow properly practices. These results are contrast with other studies, indicating that appropriate practices increases with an increase in work experience and age. In Narang et al (2012) study, the dentists were significantly more aware (P<0.001) of the way of waste collection and the disposal of different items to different color bags in the hospital. Also, there was a significant difference (P<0.05) regarding hospital waste management practices among dentists (Narang, Manchanda et al. 2012). While a few of the studies such as Sharma et al (2010) have shown poor knowledge which that due to poor attitude and practices (Sharma 2010), most studies like that of A. Njagi et al (2012), Singh et al (2010), Sachan et al (2012), Suwarna et al (2012) and Mausumi (2012) (Madhukumar and Ramesh 2012; Njagi, Oloo et al. 2012; Sachan, Patel et al. 2012;
Hakim, Mohsen et al. 2014; Singh, Pratibha et al. 2014) has shown that hospital staff in all categories have good knowledge, attitude and practices of hospital waste management and also reports submitted by else. Lalita et al (2013) revealed that majority of the participate need to systemic approach for enhance the awareness concerned with hospital waste management in direct to protection of environment and public from the adverse effect of medical waste. This has been due to unsatisfactory awareness and attitude followed subsequently poor practices (Ajai and Nath 2013). Overall, several studies cited that for best practices in hospital about waste management emphasis is on the need to raise awareness by way of integration of variety tools and actions, which that lead to the creation of a positive attitude and increased practices (Kumar, Samrongthong et al. 2013; Sanjeev, Kuruvilla et al. 2014; Malini and Eshwar 2015). At Imam Reza hospital it was found that the process of separation, collection of waste, transport of it, storage and final disposal of general waste was conducted separately in different containers and hazardous waste was collected and safeties with the standard procedures. These results can be explained with the fact that in the Imam Reza hospital where largest “therapeutics-educational center” management is relatively suitable. For this reason, low reporting of injuries reported which that may be attributed by this fact that most of the staff fortunate from a formal system toward established within all the health facilities. But about the medical waste management needs to be improved. This can be achieved by operable proper training programs for the waste and up to dating them, establishing the necessary resources like colored bags for transfer and disposal of waste in hospital (for example, Putting of sharp tools in puncture proof containers), use of protective equipment such as gloves, shoes and mask, regularly using of disinfectant, Vaccination campaigns and establish protocols for all aspect concerning hospital waste management such as transportation and disposal of them (Bathma, Likhar et al. 2012; Madhukumar and Ramesh 2012; Sachan, Patel et al. 2012; Ismail, Kulkarni et al. 2013). A systematic effort on practices is also very important and efficient.

3.4. Correlation

Figure 3 had shown that linear relationship between knowledge level with attitude and practices. The coefficient of correlation between knowledge and attitude was obtained 0.62. Correlation test indicates relatively good correlation between knowledge and attitude. Also between knowledge level with attitude and practices, correlation coefficient is 0.56 and 0.39, respectively. This low correlation can be explained by this fact that despite high awareness, staff’s poor performance cans results; lack of regular programs and on time monitoring of them.
## Fig. 3 Scatter plot of knowledge level with attitude and practices.

### Conclusion

Importance of training related to hospital waste management due to its potential hazard has been emphasized. The case of Imam Reza hospital indicates that scant awareness about hospital waste management, subsequently affects the proper practices of suitable waste management as well as several challenges are still exist. For better managing of hospital waste, periodically and regularly training program for hospital’s staff and necessity of monitoring system combined with ordering and arranging surveillance regarding practices of hospital waste management must be developed. Thus, necessary actions for increased of practices among hospital staff aiming at the integration of actions (behavior) and different tools, such as the development of procedures and policy, informative material and posters, management methods (e.g. with color coding) and training programs. These ways are evidence of the touching of international guidelines, and they’re utilizable toward trustworthy methods in different countries. We believed with integration of actions, MWM can be improved.

### Recommendation

Overall, training in hospital waste management for whole personnel in different part of hospital, especially individuals dealing with generation, handling of hospital waste and institutional administration is essential. So our suggestions divided two categories:

- ensuring about medical training curricula for all personnel
- Correct training for waste management attendant (transporters, treatment plant and landfill cadres)
By doing, planning for personnel training accompanying with monitoring on hospital waste management systems will get help.

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References:


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