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Knowledge, Attitude and Practice of Health Care Workers in Sulaimani Health Facilities in Relation to Medical Waste Management

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Abstract: ***Medical waste management is of crucial importance in health care facilities (HCF). In the present study, we assessed the knowledge, attitude and practices of medical waste management in an HCF of Sulaimani city, Kurdistan Region of Iraq. Using a self-administered questionnaire, we collected information on waste management practices from health care professionals (HCP) in 14 public and private hospitals and 10 primary health care centers of the city. Based on answers, total knowledge score on a 10-point scale was established. A total of 406 HCPs (of those, 261 women), average age 37.3 (SD ± 9.4) years participated. Just 20.3% have been trained on medical waste management. The total knowledge score ranged from 0 to 9 with a mean of 4.7 (SD ± 1.8). Factors which were significantly associated with the better knowledge score was male gender, having a high educational degree, being trained in waste management and has been in service for more than 5 years. 68% of HCPs followed the color coding system, 91% always/frequently disposed used sharps/needles to safety boxes, 79% always or frequently recapped needles, 49% reported experiencing at least one needle prick injury during their work but only 37% of them had reported the injury to a supervisor and only 4% of those injured had filled an injury form. There is a low average level of knowledge and the unsafe risky practices are quite prevalent in HCFs. Provision of appropriate training on dealing with medical waste is essential to promote safe practices among HCFs.***

Keywords: Medical waste management, health staff, recapped needles, training, KAP, Iraq

1. INTRODUCTION

The term “medical waste” is used to describe wastes generated by health facilities such as hospitals, primary health centers, research centers and clinical laboratories [1]. Medical wastes are mixtures of municipal, pharmaceutical, laboratory, pathological, chemical, plastic and metal wastes [2]. The most dangerous aspect of the medical waste comes from the handling of waste, since waste handlers are exposed to needle prick injuries by contaminated needles and sharps, which may lead infections with Human immunodeficiency virus, hepatitis B and C viruses, and this risk is highest in health facilities amongst health care workers [3].

Medical waste is considered the second most hazardous waste globally and it is required to be treated and disposed by trained health care professionals (HCPs). Knowledge, attitude and practices of HCPs are very important while managing this type of waste. Therefore education of HCPs, staff implicated in waste collection, patients, and attendant on medical waste are very important [4]. Having proper knowledge among the HCPs about the guidelines and regulations of medical waste handling can have great impact towards the safe disposal of medical waste, and can also help to protect the community from the adverse health and environmental impact of medical waste [5]. In addition to knowledge, proper and safe attitudes and practices in dealing with medical waste during handling and disposal are crucial. Inadequate training of healthcare workers and negligence in implementation of legislations and rules will cause unsafe disposal of medical waste and could lead to serious impacts on the environment and community health [6].

HCFs are in need of continuing health education for management and support staff members in order to apply safe methods of medical waste handling and management [7-9]

The aim of this study was to assess the knowledge, attitude and practices of HCPs in HCFs of Sulaimani city (Kurdistan region, Iraq) who are involved in medical waste production and management. The study also aimed to identify factors associated with better knowledge and practices of health staff in relation to medical waste management.

2. LITERATURE REVIEW

One of the major key factors for proper medical waste management is the knowledge, attitude and behaviors of the health care workers in healthcare facilities in relation to medical waste [9]. Health care personnel should have a proper level of knowledge, good attitude and practices while dealing with medical waste during handling and disposal [9]. Due to inadequate training of healthcare workers and ignorance in implementation of legislations and rules, there is indiscriminate disposal of medical

waste will have serious impacts on the environment and community health [9].

A study done in Ghaza strip – Palestine reports that private and public healthcare facilities still suffer from inappropriate management of medical waste; healthcare workers do not have information on the place of medical waste storage and methods used for management, there is a deficiency in providing training to improve their knowledge, attitude and practices and only half of those interviewed had participated in training courses about how to deal with medical waste management [10].

A study done in King Abdulla hospital in Jordan reported that despite government plans and efforts for implementation of medical waste management rules and legislations, it still does not meet the safety standards for healthcare workers inside public hospitals and outside . The study also reports that there are still many wrong practices that may lead to real problems regarding public health and environment safety [11].

In Tabriz, Iran, a study by Taghipour and Mosoferi revealed that medical wastes are poorly managed in healthcare facilities and there are no suitable health and environment safety measures available [12] it also reports that medical wastes are handled by poorly or non-educated workers without using any safety measures such as personal protective equipments [12].

A study conducted in Morocco revealed that healthcare facilities are in need of continuous training courses for old and new employees, continuing health education for management and support staff members in order to apply safe methods of medical waste handling and management [13].

A study done in Karantaka in India reported that across all participants, the knowledge regarding medical waste management was inadequate and they were unaware of medical waste management rules and regulations [9]. Another recent Indian study compared the medical waste knowledge, attitude and practices among health care personnel and showed that doctors, nurses and laboratory technicians had a better knowledge than the cleaning (sanitary) staff regarding biomedical waste management [14].

A regular training program can guarantee smooth running of medical waste managing in healthcare facilities [15].And should complementary to existing infrastructure and regulations for medical waste management. Continuous training on different aspects of handing and management of medical waste must be carried out in healthcare facilities in order to develop healthcare staff awareness regarding medical waste and its risks [15]. Medical waste handlers should be trained on segregation, handling, storage and disposal procedures [15] and should receive certificates of proficiency after successful completion of appropriate training [16]. Medical waste management supervisors and infection control officers have to provide waste handlers with personal protective equipment's such as proper gloves, masks, special shoes (puncture proof), in order to prevent needle stick injuries and various other injuries that waste handlers are exposed to [16].

All healthcare workers have to be trained in order to develop awareness before starting working in any healthcare facility [16]. Refresher training course are needed for healthcare workers in order to update and refresh the knowledge of staff dealing directly with medical wastes [16]. Training should include awareness rising about the potential hazards from waste, the purpose of immunization, safe waste-handling procedures, reporting of exposures and injuries, and the use of PPE [1]

3. METHODS AND MATERIALS

This was a cross sectional survey of the knowledge, attitude and behaviors of HCPs in Sulaimani city. The study locations were selected from a list provided by Directory of Health (DOH) planning section containing 9 nine public hospital, 1 one dental center, and 52 primary health centers (PHCs) and 18 private hospitals. All public hospitals and the dental center were included in the study. A total of ten from 52 PHCs and 5 from 18 private hospitals were selected by random sample selection. A self-administered questionnaire was distributed to 430 HCP in selected health facilities. Data collection was done during March and May 2015. All HCPs working in the selected Sulaimani city health facilities having a degree such as high school, nursing school, diploma and Bachelor of Science (BSc) were eligible to take part in the study. The self-administered questionnaires consisted of 34 questions to assess the level of knowledge, attitudes, and behaviors in relation to MWM as well as socio-demographic characteristics. A database was developed in EpiData version 3.1.1 and used for data entry. All questions were pre-coded. Analysis of data was performed using Statistical Package for Social Science (SPSS) version 17.0. Individual questions were reported as frequencies and percentages and the total knowledge score was calculated by summing all knowledge questions. The mean of this score was compared for associations using t test. Chi-squared test was used to assess associations between categorical variables.

The most appropriate way of identifying the categories of health-care waste is by sorting the waste into color-coded plastic bags or containers [1].

4. RESULTS

The sample involved 14 public and private hospitals and 10 primary health centers randomly selected from 52 health care facilities inside Suliamani city. Out of an intended sample of 430, 406 completed questionnaires were returned mounting to a response rate of 94%. 66,5 per cent of respondents were from hospitals.

Table1. Selected HCFs and number of participants

Hospitals (n=24)	Primary health centers
Shorish Teaching Hospital	Sarwary PHC
Plastic Surgery Hospital	Ibrahim pasha PHC
Shar Hospital	Shahid Rafiq hama jan PHC
Shahid Dr Hemin Teaching Hospital	Chwarbakh PHC
Peramerd Dental center	Shahid dr Sardar PHC
Sulaimani Maternity Teaching Hospital	Wloba PHC
Sulaimani Pediatric Teaching hospital	Shahid Jaza PHC
Shahid Dr.Aso Teaching hospital	Kareza wishk PHC
Herem Private Hospital	Faiq Haji Ali PHC
Hiwa Teaching Hospital	Shahid Rebaz PHC
Sulaimani Teaching Hospital	
Roonaky Private hospital	
Tooy malik Private hospital	
Soma Private hospital	

Table2. Characteristics of participants (n=406)

	#	%
Gender		
Female	261	64.3
Male	145	35.7
Age group		
21-30	121	29.8
31-40	135	33.3
41 and over	150	36.9
Qualification		
Nursing school	140	35.1
Institute	198	49.6
College	61	15.3
Working years		
1-5 years	110	27.1
6-10 years	64	15.8
>10 years	232	57.1
Training course		
Yes	82	20.3
No	322	79.7
Training course period		
1-7 days	55	67.1
>7 days	27	32.9

Table 3. Association of mean score with various characteristics of the participants

	#	Mean score	95% CI	Mean differnce	P value
Overal score	406	4.66	4.27-4.71	-	-
Gender					
Male	144	5	4.69-5.30	0.5 (0.12-0.87)	0.01
Female	261	4.49	4.27-4.72		
Service years					
0-5 years	110	4.35	4.05-4.65	0.70 (0.16-1.24)	0.01
6-10 years	64	5.05	4.56-5.54		
Institute/ collge Degree					
No	140	4.33	4.05-4.61	0.54 (0.16-0.91)	0.006
Yes	259	4.86	4.63-5.1		
Training					
Yes	82	5.62	5.24-6.0	1.22 (0.79-1.65)	>0.001
No	322	4.4	4.21-4.60		
Training duration					
1-7 days	55	5.67	5.21-6.14	0.15 (-0.67-0.99)	0.7
More than 7 days	27	5.52	4.78-6.23		

Knowledge of HCPs on medical waste management

Over 66.2% of HCPs have information on color coding system (table 3).Only 16% of HCPs had information on the amount of medical waste in relation to general waste in the hospital. About 40% knew how medical waste is managed in routine practice and over 28% knew who is responsible for MWM. While 96% of participants were aware that needle prick injury endangers health, only 73% had information on some specific consequences of needle prick injury.

When these knowledge questions were summed to obtain a total score, the total score ranged from 0 to 9 with a mean knowledge score of 4.7 (SD 1.8). Table 4 shows comparison of the mean score with various characteristics of participants. The mean score for people with a college/institute degree was 0.5 higher than the mean score of people with no degree and this difference was statistically significant. Other factors which were significantly associated with higher knowledge of waste management were male gender, being training and being in service for more than 5 years.

Table 4. Knowledge of participants on medical waste management

Knowledge question	Correct answer Number (%)
Knows color coding of medical waste.	259 (66.2)
Knows the % of medical waste from total waste.	62 (15.9)
Knows the color of municipal waste bag.	286 (71.7)
Knows how medical waste is managed.	150 (38.9)
Knows who is responsible for medical waste management.	112 (28.5)
Knows where to put sharps and needles.	264 (66.6)
Knows where to put waste the needs autoclaving.	91 (24.3)
Knows needle prick injury is dangerous.	382 (96%)
Has information on consequences of needle prick injury.	290 (73.4)

Attitude of HCPs towards medical waste management

The results of participants' opinions/attitudes on issues in relation to MWM revealed that over 96% of participants agreed with the importance of medical waste management (MWM), but 66% believed that MWM is done properly in their workplace and only 20% believed that the health facility has provided necessary training for HCP. Table 5

Table 5. Attitudes of participants in relation to medical waste management

Attitude	Correct answer Number (%)
Believes proper MW segregation and management is important	390 (96.1)
Believes MW segregation and management is a team work	330 (82.1)
Believes MW segregation management is a burden on HCP	91 (22.4)
Believes MWM is properly done in his/her workplace	265 (66.4)
Believes workplace has opened necessary courses on MWM	79 (19.9)
Feels ready to participate in training on MW management	287 (71.4)
Believes all health facilities must have a system for cleaning sewerage	380 (96.0)
Believes health authorities must be informed on breaches in relation to MWM	378 (95.9)

Practices of HCPs in relation to medical waste

The study showed that 68% of HCPs followed the color coding system for segregation of medical waste. While 91% of HCPs always/frequently disposed of used sharps and syringes to safety boxes, 9% of HCPs never or only sometimes did so. Recapping the used needles was a common practice in 79% of HCPs who always or frequently did so while only 12% reported they never recapped used needles. In this relation 49% of participants reported that they had experienced at least one needle prick injury during their work but only 37% of them had reported the injury to a supervisor and only 4% of those injured had filled an injury form. Table 6

Table 6. Practices of participants in relation to medical waste management

Practice	Correct answer Number (%)
Disposes of needles and sharps to safety box.	
Never	10 (2.5)
Sometimes	26 (6.6)
Frequently/always	359 (90.9)
Recaps needles after use.	
Never	47 (11.9)
Sometimes	35 (8.9)
Frequently/always	213 (79.2)
Performs segregation of MW according to color coding system.	268 (67.5)
Experienced injury by used needle/sharps.	
Never	204 (51.0)
Once/few times	156 (39.0)
Many times	40 (10.0)
When injured by needle/sharps, informed person in charge.	
Yes	70 (36.7)
No	100 (52.3)
Don't remember	21 (11.0)
When injured by needle/sharps, filled accident form	8 (4.2)

5. DISCUSSION

The present study was conducted in different selected public and private HCFs which are under authority of DOH in Sulaimani. The study assessed level of

knowledge, attitude, and practices of HCPs regarding MWM. The knowledge, attitude and practices of HCPs were dissimilar among participants; many factors may lead to this difference like the level of education of HCPs, working experience, participation in training courses and their practical involvement in the hospital waste handling and MWM.

This study showed that gender, service years, qualification and participation in training were statistically significant factors of better knowledge while duration of training course was not.

The current study showed that from a total of 406 HCPs participated in the study, 261(64.3%) were females and 145(35.7%) were males with female to male ratio of 1:1.8. The present study showed that 66% of HCPs have information on color coding system; this was similar to a study done in Pondicherry- India reported that 50% of HCPs had the knowledge of color coding and segregation of MWM [17], this result was also comparable to a study done in Pakistan reporting that 86% HCPs have information about waste color codes [18]. Another similar study from West Bengal revealed that 76% HCPs knew about various types of color-coding bags for collection of MW [19]. In the present study 15.9% of HCPs have knowledge about the percentage of MW in whole waste. This was similar to a study done in Delhi, India reporting that HCPs with knowledge of approximate proportion of infectious waste generated in HCFs were found to be 36% [20]. Another study from India reported that HCPs knowledge about the proportion of infectious waste generated from a hospital was found only in 39.3% of respondents [21]. This may be due to low level of HCPs knowledge and the absence of national guidelines in HCFs.

The current study showed that gender, participation in training, qualification, and service years were significantly associated with better knowledge of waste management while training duration was not. Regarding training course in relation to MWM (79.7%) of HCPs had not participated in any training courses during their working periods and only (20.3%) HCPs have participated in MWM training course. This result was similar to a study done in India revealed that around 16% HCPs had received training on MWM [22] another study in Puducherry-India reported that (74%) of HCPs have not undergone training on medical waste management [17]. This result was inconsistent with a study done in Turkey that reported that training of staff on medical waste was about 80% [23]. Also another study revealed that majority (87%) of HCPs had undergone training program on medical waste management [24]. The low participation in training highlights the need for strengthening training courses and involving all HCP in such trainings. This study also shows the need for such training programs to be conducted regularly and make it compulsory for all the HCPs to attend either annually or at the beginning of their service. In the present study 96% of HCPs knows that needle prick injury is dangerous. It is similar to a study done in Bosnia and Herzegovina reported that 70% of HCPs were aware that needle prick injury carries risk for blood borne infection [25]. In the current study 96% of HCPs believe that proper management of MW is important, 82% believes that MW management is a team work, it is similar to a study done in Lucknow -India which revealed that majority of HCPs has seen MWM process as a team work and all were responsible for safe disposal [17]. This is not consistent with a study done in India which revealed that 82% has seen that safe management of healthcare waste was the responsibility of the institution and not the HCPs [26]. This difference may be due to education level, knowledge, and attitude of participants. In the present study 22% of HCPs believe that MWM is a burden on HCPs. This result was inconsistent with a study done in India revealed that attitude and practices towards BMW management majority 90% has seen that safe management of health care waste was an extra burden on work, however, 85% felt that safe management of BMW was not an issue at all [26]. In the current study 66% of HCPs believes that MWM is properly done in the workplaces and 54% of HCPs were satisfied about MWM process in their workplace. This result was similar to a study done in India reporting that 36% HCPs were satisfied about waste disposal practiced in their hospital [20].

In the present study 71% of HCPs were ready to participate in voluntary training courses regarding MWM, and this rate is comparable to a study in India (96%) where HCPs would like to attend a training program on BMW management [27]. Another study in Dilhi-India revealed that 56% of all HCPs would like to attend voluntarily programs to upgrade their knowledge on BMW [17]. However, a study from East Anglia, UK revealed that 22% HCPs don‘t mind to voluntary attend the training sessions [28]. The present study showed that 96% of HCPs believes all health facilities must have a system for cleaning sewerage, 95% of HCPs believes health authorities must be informed on breaches in relation to MWM, 95% HCPs thought that it is important issue to report to DOH if their workplace is not complying with standard MWM guidelines. This proportion is over what is reported by a study from Delhi, India which reported that 52% HCPs expressed their willingness on reporting to health authority of India about the institutions who is not complying the guidelines for MW management [17].

Regarding practices of HCPs, 91% disposes of needles and sharps to safety box frequently/always. This result was better than 53% reported from Ethiopia [29]. This may due to that DOH have provided all HCFs with adequate number of safety boxes to ensure the safe disposal of needles and sharps. The present study showed that 79% of HCPs recap needles after use either frequently or always which is a risky practice exposing the person to needle prick injury. This is similar to a study done in Puducherry, India reported that nearly 50% of HCPs recap the needle [17]. It is also consistent with a study done in Nagara, India reporting that practice of recapping the needles was observed to be 67% among all the categories of HCPs [27]. This result was different from a study done in Ethiopia showed that (73 %) do not practice recapping needles after injection [29]. In Lebanon, a study revealed that 67% HCPs were aware that needles should not be recapped after use [30]. In a study done in India, the practice of recapping of used

needles was done by 25% [24]. In the current study the practice of recapping the used needles may be due to lack of awareness and continuation of an old habit, difference in academic background of HCPS and lack of adequate number of needle cutters in the HCFs. This risky practice could be managed by providing all HCFs with needle cutters with enforcement rules for safe disposal of used needles and sharps in HCFs.

In relation to experiencing injuries, in the current study 49% of HCPs experienced injury by used needle/sharps either once or multiple times during their working time, which was consistent with a study from India reporting that 55% HCPs had experienced needle prick injuries in their work life [31]. Another study done in Cairo revealed that 46 % of HCPs had needle prick injury or sharp injury and 19% of health care worker had sharp or needle prick injury within the last year [32]. Another study identified that 51% HCPs were subject to injuries caused by a sharp tool in a 6-month period and that 80% of those injuries were inflicted by injectors [33]. In a study from Karnataka, India experiencing of needle prick injury was less than the present study and only 21% of medical staff reported needle prick injuries [34]. This difference may due to lack of occupational health and safety section and guidelines in the HCFs. This risk could be minimized or avoided by opening regular training courses, and enforcement of all HCPs to enroll in these courses. The present study showed that 52% of HCPs when injured by needle/sharps did not report even verbally persons in charge which is not a safe practice and is in contrast to the study in which only 19.9% of the needle pricks injured respondents did not report to the hospital authority [35]. Another study from India reported that 55% of HCPs had reported the incident to the higher authority [21]. It is important to issue clear guidelines and procedures to HCFs and HCPs to report any such injuries to the authorities and provide required treatment and support needed.

6. CONCLUSION

It is clear from this study that there is low level of knowledge about MWM and there are prevalent unsafe practices among HCPs in relation to waste management and occupational safety. There is need for training and awareness programs about different components of medical waste management and occupational safety for HCPs for waste collectors and cleaners who are engaged directly in the process of handling, collecting and disposing medical waste. Clear MWM guidelines have to be adopted and enforced in HCFs to reduce risks on patients, HCPs, and the community. Guidelines and procedures should be put into place to record and report any breaches in relation to MWM and any occupational risks affecting HCPs.

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