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**Original Article**

# Performance Evaluation of Waste Management Practices at District Head Quarters Hospital Sheikhupura

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## ABSTRACT

Hospital waste management (HWM) is extremely important and it is very different kind of waste that has high potential of spreading infection and diseases. There should be proper management of this waste, otherwise it can be hazardous **Objective:** The objective of the study is to evaluate the waste management practices at DHQ Hospital, Sheikhupura **Methods:** It was cross-sectional hospital-based study. The study was carried out at DHQ Hospital Sheikhupura. The sample size of the study was 169 including 94 waste handlers, 45 nurses and 30 doctors were included. Data was collected through questionnaire using non-probability convenient sampling technique, which was entered and statistically analyzed using SPSS 20.0. **Results**: Among 94 waste handlers, 30.8% were 21-30 years old, 64.9% males and 45.7% had up to 5 years' work experience. 67.0% had been vaccinated, 87.2% confirmed that waste is segregated at source and100.0% waste handlers were provided with color bags for various types of hospital wastes. 92.6% stated that pre-treatment procedure is carried out before hospital waste disposal and 75.5% waste handlers were provided with protective gears. Among 45 nurses, 55.6% were 31-40 years old and 64.4% had up to five years' work experience. 100.0% nurses ensured internal collection of waste bags & containers and their transportation to the central storage facility of hospital on the daily basis. 82.2% coordinated and monitored all the operations related to waste management and for this purpose regularly met with hospital waste management committee. 100.0% nurses recorded the waste quantities generated by the department on weekly basis. Among 30 doctors, 73.3% organized training activities for HWM staff on safe waste management procedures.**Conclusion**: Study concluded that waste management practices among doctors, nurses and waste handlers were found satisfactory.

## INTRODUCTION

Role of medical care is most significant in preventing life, human health and well-being [1]. However, during patients' treatments, health facilities produce several kinds of wastes. Main function of health facility is to save patients and health of public from numerous diseases. But during patients diagnosis and treatment contagious wastes are produced as these wastes have an elevated risk of communicable disease for both patients and health care provided working at hospital [2].

The World Health Organization (WHO) describes hospital waste as the waste produced by hospitals during treatment comprising used syringes, needles, solid dressings, diagnostic samples, body parts, blood, medical devices, radioactive materials and chemicals etc [3]. Hospital waste is categorized into 2 categories such as hazardous and non-hazardous waste [4]. According to WHO, 75 percent to 90 percent waste produced by health facility is non-hazardous but remaining proportion is believed hazardous [5]. The frequency of waste produced by hospital differs among world countries and even within same state [6]. In the various states for instance America, United Kingdom, India, Italy, China and Japan, the waste produced (in kilogram bed−1day−1) is 14.5 [7], 5.5 [8], 1.60 [9], 3–5 [6], 0.68 [10], and 2.05 [11], respectively. Researches carried out in Pakistan demonstrated that almost 2.0 kilogram waste per bed daily is produced [12]. The amount of waste produced by hospitals have been enhanced caused by disposable products utilization as well as developing technology of healthcare [6,7].

Management of health facility waste is a global issue [3]. The practice comprises entire activities engaged in the waste generation, transportation, segregation, treatment, storage, and final removal of the waste from hospital [13]. However, consistent records regarding type and amount of

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hospital wastes as well as management procedures are lack, the problem related to hospital waste management is more dominant among developing states that produce several hundreds of tons waste [14]. During 2002, WHO made an assessment among twenty two developing states which demonstrated that percentages of hospitals which did not utilize adequate waste management technique was found significant from 18 percent to 64 percent.[15] Mismanagement of health care waste causes environmental contamination as well as infections such tuberculosis, cholera, typhoid, and several other diseases for example hepatitis, human immunodeficiency virus and acquired immunodeficiency syndrome[12,16].

To improve hospital waste management, Pakistani Government enacted HWM (Hospital Waste Manager) 2005 rules on the basis of PEPA (Pakistan Environmental Protection Act) 1997. It was first complete statute that had aim to attain sustainable developments in the practices regarding HWM [17]. In Pakistan, generally the most common methods utilized are autoclave, land filling, open dumping and incineration. Before the waste final disposal, numerous action must be taken such as segregation of waste (composition and nature) for easy transportation making sure least exposure to the atmosphere, waste storage, treatment and labelling[18,19].

Like several other underdeveloped countries, in Pakistan also previous researches have demonstrated weak management practices regarding hospital waste management [17,20]. Studies carried out in main cities of Pakistan (namely Lahore, Karachi, Islamabad and Rawalpindi) have constantly demonstrated health care waste mismanagement regarding segregation and proper disposal techniques [21-24]. Health care industry is growing rapidly that in turn has caused significant rise in the amount of health care waste generation, mostly by clinics, hospitals and several other health care establishments. The increasing amount of hospital wastes is creating considerable hazards for public health and environment worldwide. The condition is worsened due to inappropriate disposal techniques, lack of physical resources and research about health care waste management. Therefore, current study is carried out regarding performance evaluation of waste management practices at DHQ Hospital Sheikhupura.

It was cross-sectional hospital-based study. The study was carried out at DHQ Hospital Sheikhupura. The sample size of the study was 169 including 94 waste handlers, 45 nurses and 30 doctors were included. Data was collected through questionnaire using non-probability convenient sampling technique, which was entered and statistically analyzed using SPSS 20.0. Relevant statistical tests were applied. Frequencies and percentages were calculated and data was presented in tables and graphs.

## RESULTS

Information about waste handlers

Among 94 waste handlers, 8 (8.5%) were 20-30 years old, 29(30.8%) waste handlers were 31-40 years old and 45 (47.9%) waste handlers were 41-50 years old while 12 (12.8%) were 51-60 years old. Total 61 (64.9%) were males and 33 (35.1%) were females. Majority 54 (57.5%) was under matric while 27(28.7%) had matriculation certificates and 13(13.8%) were above matric.

Table demonstrates that among 94 waste handlers, 43 (45.7%) had 2-5 years work experience while more than half 51(54.3%) had > 5 years work experience. Majority 63(67.0%) had been vaccinated but 31 (33.0%) waste handlers were found unvaccinated.

Information about nurses

Among 45 nurses, 11(24.4%) were 25-35 years old, 25(55.6%) nurses were 36-45 years old and 9(20.0%) were 46-55 years old. Total 32 (71.1%) had gradation degrees while 13(28.9%) nurses were above gradation.More than half 29 (64.4%) had 2-5 years work experience and 16 (35.6%) nurses had work experience > 5 years.

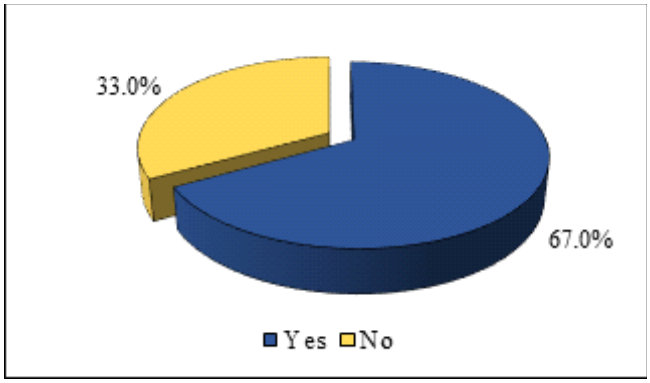


**Figure 1:** Frequency distribution of waste handlers according to vaccination status

### Waste management practices of waste handlers

Table-1 indicates that among 94 waste handlers, mainstream 82 (87.2%) confirmed that waste is segregated at source while 12 (12.8%) waste handlers replied in negative. All (100.0%) waste handlers were provided with color bags for various types of hospital wastes. All (94) waste handlers reported that both risk and non risk wastes are stored in the hospital at different points.

All (100.0%) respondents confirmed that both risk & non-risk wastes are separately transported.

Table elucidates that among 94 waste handlers, majority 87 (92.6%) stated that pre-treatment procedure is carried out before hospital waste disposal while 7(7.4%) waste handlers were not agreed with it. Result shows that all waste handlers said that device for needle / syringes nozzle destruction was

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available in the hospital. Among 94 waste handlers, majority 63 (67.0%) said that chemical disinfection method is utilized in the hospital for infectious waste while 31 (33.0%) denied. Table 1 indicates that 100.0% wastes handles confirmed the availability of incinerator for hospital. Among 94 waste handlers, 46 (48.9%) said that ash store is available in the hospital while more than half 48 (51.1%) were not aware about it. Table 1 indicates that among 94 waste handlers, 71 (75.5%) were provided with protective gears while 23 (24.5%) were not.

**Waste management practices of nurses**

Table 2 indicates that all (100.0%) nurses ensured internal collection of waste bags & containers and their transportation to the central storage facility of hospital on the daily basis. Among 45 nurses, 31 (68.9%) liaised with supplies dept. to make sure that adequate supply regarding containers, waste bags, collection trolleys and protective clothing are available all the time while 14 (31.1%) nurses did not. Result shows that all nurses (100.0%) ensured that sanitary staff & sweepers replace immediately used items such as bags, syringes, cotton, bandages and shifted from the containers, is cleaned and replaced with new bag soon after. Among 45 nurses, majority 39 (86.7%) directly supervised sweepers assigned to collect & transport the waste while only 6 (13.3%) did not.

Among 45 nurses, the mainstream 41 (91.1%) ensured correct utilization of the main facility for storage and that it is only permitted for authorized personnel, except 4 (28.9%) nurses. Among 45 nurses, 37 (82.2%) coordinated and monitored all waste disposal operations and met with hospital waste management committee while 8 (17.8%) nurses did not ensured and monitored. Table shows that all nurses (100.0%) ensured that sanitary workers were not segregating the waste properly and that they only handle waste bags and containers in correct manner. Out of 45 nurses, major proportion 32 (71.1%) ensured that emergency procedures are available while 13 (28.9%) nurses did not ensure. Among 45 nurses, 26 (57.8%) investigated, recorded and reviewed all incident report regarding hospital waste management and 19 (42.2%) nurses did not. Table highlights that all nurses (100.0%) recorded the weekly waste quantities produced by the department.

| Waste management practices (n=94) | Yes | | No | |
|---|---|---|---|---|
| | Freq. | %age | Freq. | %age |
| Waste segregation at source | 82 | 87.2 | 12 | 12.8 |
| Colour bags provided for different types of waste | 94 | 100.0 | 0 | 0.0 |
| Risk and non risk waste stored at different points | 94 | 100.0 | 0 | 0.0 |
| Risk & non -risk transportation wastes transported separately | 94 | 100.0 | 0 | 0.0 |
| Any pre -treatment procedure done before disposal | 87 | 92.6 | 7 | 7.4 |
| Needle/syringes nozzle destruction device | 94 | 100.0 | 0 | 0.0 |
| Chemical disinfection method for infectious waste | 63 | 67.0 | 31 | 33.0 |
| Incinerator available for hospital | 94 | 100.0 | 0 | 0.0 |
| Ash store available | 46 | 48.9 | 48 | 51.1 |
| Provision of protective gears | 71 | 75.5 | 23 | 24.5 |

**Table 1:** Frequency distribution of waste handlers according to waste management practices

| Waste management practices(n=45) | Yes | | No | |
|---|---|---|---|---|
| | Freq. | %age | Freq. | %age |
| Do you ensure internal collection of waste bags and containers and their transport to central storage facility of the hospital on daily basis | 45 | 100.0 | 0 | 0.0 |
| Do you liaise with the supplies department to ensure that an adequate supply of waste bags, containers, protective clothing and collect ion trolleys are available at all time | 31 | 68.9 | 14 | 31.1 |
| Do you ensure that sanitary staff and sweepers immediately replace used bags and containers with the new bags and containers of the same type and where a waste bag is removed from containers, is properly cleaned before a new bag is fitted therein | 45 | 100.0 | 0 | 0.0 |
| Do you directly supervise hospital sweepers assigned to collect & transport the waste | 39 | 86.7 | 6 | 13.3 |
| Do you ensure correct use of the central storage facility and that it is kept secured from unauthorized access | 41 | 91.1 | 4 | 8.9 |
| Do you coordinate and monitor all waste disposal operations and for this purpose meet regularly with hospital waste management committee | 37 | 82.2 | 8 | 17.8 |
| Do you ensure that sanitary staff and sweepers are not involved in waste segregation and that they only handle waste bags and containers in the correct manner | 45 | 100.0 | 0 | 0.0 |
| Do you ensure that emergency procedures are available that all staff members are aware of the action to be taken by them | 32 | 71.1 | 13 | 28.9 |
| Do you investigate, record and review all incident report regarding hospital waste management | 26 | 57.8 | 19 | 42.2 |
| Do you record quantities of waste generated by department on a weekly basis | 45 | 100.0 | 0 | 0.0 |

**Table 2:** Frequency distribution of nurses according to waste management practices

| Waste management practices (n=30) | Yes | | No | |
|---|---|---|---|---|
| | Freq. | %age | Freq. | %age |
| Do you ensure that all nurses, clinical and non clinical staff in your departments is aware of and properly trained in waste management procedures | 19 | 63.3 | 11 | 36.7 |
| Do you arrange proper supervision of the sanitary staff and sweepers of your department to ensure that they comply with waste management procedure a t all times | 17 | 56.7 | 13 | 43.3 |
| Do you liaise with the waste management officer or the person incharge for waste management in your department for effective monitoring and reporting of mistakes and errors in implementation of waste management plan | 16 | 53.3 | 14 | 46.7 |
| Do you give advice to staff of your department regarding the infection control | 21 | 70.0 | 9 | 30.0 |
| Do you identify training requirements of your department for each category of staff for HWM | 25 | 83.3 | 5 | 16.7 |
| Do you organize training and refreshers courses of HWM staff of your department on safe waste management procedures | 22 | 73.3 | 8 | 26.7 |

**Table 3:** Frequency distribution of doctors according to waste management practices

**Waste management practices of doctors**

Table 3 exhibits that among 30 doctors, 19 (63.3%) ensured

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that all nurses, clinical and non clinical staff in their departments is aware of and trained properly in the waste management procedures while 11 (36.7%) did not. Among 30 doctors, 17 (56.7%) were supervising the sanitary workers of their department and made sure that they are complying with the waste management guidelines in true spirit but (43.3%) doctors did not.

Result shows that among 30 doctors, 16 (53.3%) liaised with waste management officer or person incharge for the waste management in their department for effective supervision and monitoring and were reporting the errors and hurdles in the implementation of the recommended guidelines while 14 (46.7%) doctor did not. Among 30 doctors, major proportion 21 (70.0%) gave advice to the staff of their department regarding infection control but9 (30.0%) doctors did not give advice. Out of 30 doctors, majority 25(83.3%) identified the mandatory requirements for training for different categories of the staff of their department for HWM while 5(16.7%) doctors did not identify. Among 30 doctors, 22(73.3%) organized training and refreshers programs of HWM staff on the waste management procedures which are safe and ensure safety, while 8(26.7%) doctors did not organize.

Comparison of waste management practices among waste handlers, nurses and doctors

*Chi square* test was applied to compare the waste management practices among waste handlers, nurses and doctors. Among waste handlers, 89.4% had satisfactory practices and 84.4% nurses had satisfactory practices while 66.7% doctors had satisfactory waste management practices. This difference was found statistically significant (p-value= 0.013). Waste handlers and nurses had significantly higher satisfactory waste management practices as compared to doctors.

| Group | Waste Management Practices | | P-value |
|---|---|---|---|
| | Satisfactory | Unsatisfactory | |
| Waste Handlers | 84 | 10 | 0.013* |
| | 89.4% | 10.6% | |
| Nurses | 38 | 7 | |
| | 84.4% | 15.6% | |
| Doctors | 20 | 10 | |
| | 66.7% | 33.3% | |

**Table 4:** Comparison of waste management practices among waste handler, nurses and doctors


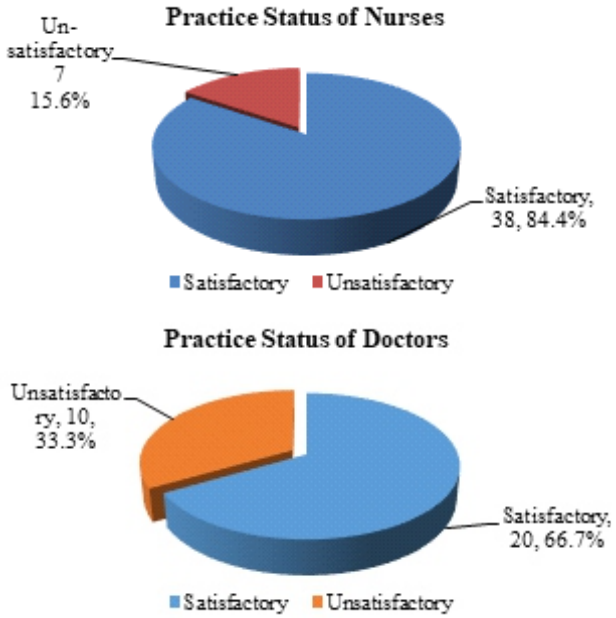


**Figure 2:** Comparison of waste management practices among waste handler, nurses and doctors

## DISCUSSION

The study was conducted to evaluate the waste management practices at DHQ Hospital Sheikhupura. To acquire adequate outcomes, total 169 respondents (94 waste handlers, 45 nurses and 30 doctors) were included in the study. Study revealed that most of the waste handlers (60.7%) were above 30 years old while remaining proportion (39.3) was upto 30 years old. The findings of our study are comparable with a study undertaken by Anwar and coworkers (2013) who also confirmed that mainstream (59.2%) of waste handlers was more than thirty years old and 40.8% waste handlers were upto thirty years old [25].

As far as gender of the waste handlers is concerned, study disclosed that male waste handlers were in majority (64.9%) and only 35.1% were female waste handlers. Virtually, the similar results were reported by Anwar and coworkers (2013) that 65.8% were male and 34.2% were female waste handlers [25]. Role of education and experience can never be underestimated for the handling of hospital waste in a better way. Study demonstrated that more than half of the waste handlers were under matric and 54.3% waste handlers had work experience above 5 years. The results of a study carried out by Umar and Yahaya (2014) exhibited better scenario than our study results who reported that 79.5% waste handlers had work experience above 5 years [26].

Vaccination of entire hospital staff is essential to prevent them from infectious diseases but study showed that 67.0% waste handlers were vaccinated while 33.0% were found unvaccinated. The findings of our study are comparable but showed better situation than the study done by Amin and associates (2013) who stated that among waste handlers,

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60.0% were vaccinated while 40.0% were unvaccinated [27]. Another study conducted by Anwar and coworkers (2013) showed worse situation that 77.5% waste handlers were found unvaccinated [25].

It is important to mention here that significant majority (87.2%) of waste handlers segregated the waste at source but Arab and collaborators (2008) indicated in their study that 90.0% waste handlers segregated the waste at source [28]. Study further showed very encouraging results that 100.0% waste handlers were provided with different color bags to collect the general and infectious waste separately. Almost similar results were reported by a study carried out by Farooq and partners (2017) who confirmed that 90.0% waste handlers were provide with different color bags [29]. Another study carried out by Amin and associates (2013) asserted that only 40% of waste handlers used different color bags for hospital waste collection [27].

It was very encouraging that all wastes handlers corroborated that in the health facility, risk and non-risk are kept at separate stores and these stores are located away from food areas and kitchen. It is significant to mention that 100.0% waste handler explained that both wastes (risk and non-risk) are transported separately outside the hospital through sanitation trucks. Arab and collaborators (2008) confirmed in their study only 23.0% waste handlers said risk and non-risks wastes are transported separately [28]. But Anwar and coworkers (2013) showed very awful situation that municipal vehicle was used to transport the hospital waste [25].

Hospital waste is a health hazard not only for hospital staff but also for general public. If treatment is carried out before disposal health hazards could be reduced. Study revealed that significant majority (92.6%) of waste handlers reported that pre-treatment procedure is carried out before disposal of hospital waste. The results of our study are very much better than the study undertaken by Umar and Yahaya (2014) who elucidated that 100.0% waste handlers confirmed that pretreatment procedure is not carried out before disposal of medical waste [26].

Incinerator plays an important role in hospital waste disposal process. Study showed that 100.0% waste handlers confirmed the availability of incinerator for hospital. The results of our study exhibited better situation than the study carried out by Qadir and teammates (2016) who asserted that only 53.3% respondents confirmed the availability of incinerator for hospital [12]. Availability of protective equipment prevents hospital staff from numerous health hazards. The results of the study indicated that 75.5% waste handlers were provided with protective equipments such as gloves, masks, caps and aprons. A similar study carried out in Yemen by Al Emad (2011) showed very devastating situation that only 20.0% waste handlers had protective equipment [30]. Another study conducted by Amin and associates (2013) confirmed that only 26.7% waste handlers were provided with gloves and masks while 20.0% with aprons, boots and leg protectors [27]. During study waste management practices among forty-five nurses were also assessed and found that most of the nurses were above 35 years old, graduate and had 2-5 years work experience. Study found satisfactory role of nurses because hundred percent nurses ensured on daily basis of waste collection and their shifting to the main storage of health facility and that waste handlers are not engaged in the segregation. They ensured that sweeper and sanitary staff replace immediately used bags & containers with new containers and bags. They also maintained the record on weekly basis regarding waste quantity produced by the department. Among nurses, more than half (68.9) liaised with the supplies dept. to make sure adequate supply of containers, waste bags, collection trolleys and protective clothing all the time. Likewise 86.7% nurses supervised directly the sweeper responsible for collection and transportation of waste while 82.2% nurses coordinated & monitored all the waste disposal operations and in this association they met with waste management committee of health facility on regular basis.

Appropriate handling of different kinds of hospital waste is important so as to minimize the risk at workplace. When the waste management practices among doctors were evaluated, study showed satisfactory results that mainstream of doctors ensured that all the healthcare staff is well trained in waste management procedures. They properly supervised the sanitary workers that they comply all the times with waste management process and also liaised with officer responsible for waste management regarding effective monitoring as well as reporting of errors/mistakes in waste management plan implementation. Majority of the doctors also advised their department staff for infection control, identified training requirements and organized training programs for hospital waste management staff regarding hospital waste management.

## CONCLUSION

Study concluded that waste management practices were found satisfactory among health care workers because 89.4% waste handlers, 84.4% nurses and 66.7% doctors were performing these practices. There is need to provide protective equipments to all waste handles and to improve their vaccination status. Further studies are required to be conducted on large scale to evaluate the waste management practices among health care workers.

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