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TURNING THREATS INTO OPPORTUNITIES: REVAMPING THE GAPS IN HOSPITAL WASTE MANAGEMENT THROUGH DOCUMENTATION, AWARENESS, AND SENSITIZATION FOR PUBLIC

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ABSTRACT

Hospital Waste Management (HWM) for a hospital is a vital aspect for maintenance of hospital hygiene, so that the public health safety is assured. However due to lack of systems integration and deployment apart from availability, waste management is ignored. The research explored Abbas Institute of Medical Sciences (AiMS) as a hub to identify these gaps through documentation and propose interventions to improve. Based on standard guidelines and processes, observational study followed by respondents data collection was done to correlate. As per observational study, HWM policy, plan and strategies were mainly missing and specific roles & responsibilities were poorly managed. Respondents data (Sample 46) correlated with observational study. 57% respondents were not aware of any HWM system in facility, 74% have not been aware of the any display of HWM plan, 67% were not aware of the policy, 57% lacked awareness about designated roles and responsibilities, 78% have not been able to participate or aware of progress review meetings, 87% lacked knowledge of departmental engagement. The identified gaps were later reported and proposed strategy is advised to improve the current devastating situation.

Keywords: Environmental Design, Hospital Waste Management, Public awareness, User satisfaction, Public sensitization.

INTRODUCTION

Human activities create waste and mismanagement of generated waste can become hazardous and dangerous for the ecosystem of area (Demirbas 2011). Medical waste is considered as a hazardous waste (Bhatii et al., 2020). As it requires specific pre-treatment prior to its ultimate disposal therefore it is an obligation on hospitals to treat and dispose medical waste according to the defined standards(Ali, Mahmood et al. 2015). Hospital waste management in Pakistan continues to be an issue of grave concern. Due to improper hospital solid waste collection, public health is at risk and environmental degradation occurs. In Pakistani hospitals, there is no proper waste collection system (Ali, Wang et al. 2016). Abbas Institute of Medical Sciences is one of the oldest hospitals of Muzaffarabad, Azad Kashmir. It is also a teaching and training hospital of Azad Jammu and Kashmir (AJK) Medical College dedicated to health professional education (Hamoda, El-Tomi et al. 2005). But based on recent observational study as well as through visiting the place multiple times, it was observed that there is a lack of HWM system strict compliance.

Hence due to lack of implementation of standardized HWM protocols, there was a high risk of people and environment being getting ill with infections and contaminated waste respectively in the selected premises. Thus a strong need to explore the current practices, their documentation, comparison with EPA guidelines and identification with gaps and later devise actions to mitigate these risks became the source motivation towards the research. In order to proceed ahead following major research objectives were set forth:

1. To observe existing waste management practices at selected Hospital in Muzaffarabad city.
2. To identify gaps in existing waste management practices in relation to EPA waste management practices and guidelines.
3. To propose optimal waste management strategy for major waste generated.

This research aimed at documenting and exploring the current issues associated with lack of Hospital Waste Management in hospitals and allied environmental aspects in the selected hospital facility of Muzafarabad city. This study could also be used for similar scale exploration of facilities and its proposed interventions and strategies to manage the identified gaps may help develop and improve better HWM design solutions for the future projects as well as improving the existing facilities of similar scale.

REVIEW OF LITERATURE

Hospital is a facility, which is build and equipped for treatment of diseases of sick and injured people. Modern hospitals are also used as a teaching facility for diagnosis of diseases. Hospitals may be compared by various means; such as by the type of service, by its size, and its facilities. Examples consist of the general hospital, the specialized hospital, the short-stay hospital and the long-term hospital (Hall, 2008). Waste is anything which is not intended for further use. The main types of wastes are domestic wastes, commercial wastes, construction wastes, biodegradable wastes, non-bio degradable waste, industrial waste and hazardous waste. The management of waste requires special knowledge and detailed guidelines and it should be carried out specialists of process (Porter, 2010). Waste generation rates are affected by socioeconomic conditions of people, the level of industrialization in particular area and the local environment. Usually, waste production is higher in areas of the greater economic prosperity and high urbanization (Bhatti et al., 2023).

Hospital waste is a major category of waste which is produced during diagnosis and treatment of immunization of humans in a hospital. The waste from hospital is the outcome of health services rendered by healthcare facilities to the population. In Pakistan around 2 kilogram of waste per bed per day is produced out of which 0.1 to 0.5 is a hazardous waste. Moreover, daily around 5 to 2000 kg of waste is generated in healthcare facilities of which 75 percent to 90 percent is non-risky while 10-25 percent is of infectious type which requires more careful disposal.

Infectious waste is of several types such as human tissues. There is a need of segregation of hospital waste from solid waste for the human and environmental safety (Khattak, 2009)

Usually, the larger quantity of waste generated in hospitals is general waste however; hospitals may generate some infectious wastes also. General waste is a type of a municipal waste. It is also disposed in municipal landfills sites. To minimize public health risk at large, waste segregation should be carried out thoroughly prior to its disposal by hospital management. (Tanaka et al. 2008)

As per World Health Organization (WHO), hospital waste is broadly classified into non-hazardous waste and hazardous waste categories. These categories are further divided into sub categories.

Following table shows this classification of waste.

TABLE 01 WHO proposed hospital waste classification

Non-Hazardous:

Waste Category	Description and Examples
1. General Waste	No risk to women health. Example: paper, kitchen waste, wrapping, sweeping etc.

Hazardous:

2. Pathological Waste	Human tissues or fluid. Example: body parts, blood, body fluids etc.
3. Sharps	Sharp waste. Example: needle, scalpels, knives, blades etc.
4. Infectious waste	Which may transmit bacterial or parasitic disease to human being, Example: tissues, bandage etc.
5. Chemical waste	Example: Laboratory reagent and disinfectants
6. Radio-active waste	Example: Unused liquid from lab research, contaminated glassware etc.
7. Pharmaceutical waste	Expired outdated drugs
8. Pressurized container	Gas cylinder, aerosol cans etc.
9. Genotoxic waste	Waste containing cytotoxic drugs (often used in cancer therapy)

Hospital waste management becomes an important area because of its infectious nature. Therefore, it is a need that segregation, collection, wrapping, storing, transportation and disposal of hospital waste should be properly followed. Moreover omissions and negligence should be recorded with regards to the treatment of infectious waste. Incongruous segregation practices are the prime cause which results in increased quantities of waste therefore higher expenses for its disposal.(Tsakona et al. 2007) Different kind of hazardous waste is generated from health care activities. Mismanagement of this waste causes various environmental and health impacts.

Figure 01 WHO proposed Hospital Waste Management Cycle

Most of the developing countries have resource scarcity to deal with hospital waste. The developing countries have rules and regulation for hospital waste management but there is a lack of implementation of these. Also, there is no knowledge regarding proper hospital waste management for hospital staff. Besides, sanitary staff works without proper safety equipment and immunization. Un-segregated waste is illegally recycled. In short, there are several issues associated with improper hospital waste management. Optimal Hospital management strategy is the only way to reduce harmful effects of hospital waste (Ali, Wang et al. 2016).

Further, Hospital Waste Management Rules 2005 provides guidelines about following.

Waste Segregation: Risk waste is segregated from non-risk waste at wards and other departments of hospitals. It also means not allowing hazardous waste to mix with non-hazardous waste. Waste segregation is at point of origin. **Waste Collection**: Waste is collected as per waste management plan. All the waste collectors wear protective equipment. Similarly, collection of waste is done is colored covered bins. Similarly, care is taken that bottom of

containers should not be thrown or dragged over floors. **Waste Transportation**: Waste is transported by designated trolleys through the designated route according to the scheduled time. Transportation of waste off-site is a responsibility of local council or municipal corporation. **Waste Storage**: A separate storage facility is provided with a sign of bio hazard symbol. **Waste Disposal**: Depending on type and nature of waste material, it is properly disposed of either through incineration, chemical disinfection or any other method. **Accidents and spillages**: In case of accidents and spillages, actions are carried out as per waste management plan. **Waste Minimization and Reuse**: Hospital takes steps for waste minimization and reuse. Similarly, waste reduction practices will be followed in all departments of hospital. Moreover, waste will be reduced at its source of origin. **Inspection**: A health officer inspects hospital premises including incinerators and landfill sites.

According to recent study in done in Pakistan with an overview of the hospital waste management (Mukhtar et al., 2018), hospital waste management has been a critical aspect of daily operational work of any hospital. This waste is generated from all departments of the hospital and have many categories which require prior treatment before fit for final handling. It was concluded through research that major waste management techniques used in multiple hospitals of Pakistan i.e. incineration, landfilling, autoclave and open dumping has severe negative environmental impacts as most of the hospitals lack proper implementation of the EPA guidelines. There is a high need to incorporate these guideline sin the current practices to ensure environmental impacts could be reduced. Proposed techniques referred in text mainly included low temperature plasma, irradiation technology, reverse polymerization, and bioconverters (Mukhtar et al., 2018).

In another review study done by (Arshad et al., 2011), Shaukat Khanum Memorial Caner Hospital and Shalimar Hospital have been able to implement EPA guidelines and have proper protocols and standard systems operation in their premises to handle the hospital waste. According to a another study in Tehran about hospital waste management systems and practices, Hospitals wards have been considered as one of the most critical waste generation source and have contributed to the most in hospitals studied across the country. About one-fifth of the wards were suffering from poor management of their medical waste and only a minority of wards obtained good scores for managing their waste materials. In summary, the study indicated a moderate management in all processes of separation, collection, containment, removal and disposal of waste materials in hospitals with several observed problems in the process (M. Arab et al., 2008).

In another study of Iran, it was observed that waste generation of the hospital depends on the scale and nature of the hospital. In general, it was observed that it was about 2.5-3.0 Kg / day / patient was produced from the explored hospitals. The overall waste constituted of 85 to 90% of domestic waste and 10 to 15% of infectious waste. With respect to the observational study and data collected through questionnaires, The lack of separation between hazardous and non-hazardous waste, an absence of the necessary rules and regulations applying to the collection of waste from hospital wards and on-site transport to a temporary storage location, a lack of proper waste treatment, and disposal of hospital waste along with municipal garbage, were the main issues identified (Mahdi et al., 2009).

In another study done in Pakistan Punjab, multiple governmental hospitals were evaluated with respect to waste generated. It was concluded that the weighted average total, general and infectious hospital waste generation rates were found to be 0.667, 0.497 and 0.17 kg bed-day−1, respectively. Of the total, 73.85% consisted of general, 25.8% consisted of hazardous infectious and 0.87% consisted of sharps waste. The general waste consisted of 15.76% paper, 13.41% plastic, 21.77% textiles, 6.47% glass, 1.99% rubber, 0.44% metal and 40.17% others (Mustafa at el,. 2015).

Hospital waste management means to limit spread of diseases by management of waste produced in healthcare centers in hospitals. (Mahmood, Saqib et al. 2001) In medical facilities, both hazardous and non-hazardous waste is produced which needs special attention for its disposal. Improper waste management poses major environmental and public health threats (Jang, Lee et al. 2006). Proper knowledge regarding segregation, collection, storage, transportation and disposal of waste is

lacking (Arshad, Nayyar et al. 2011). Studies present that in Pakistan around 2 kilogram of waste per bed per day is produced out of which 0.1 to 0.5 kilogram is a hazardous waste. There is a need for the health workers to specially understand how to handle medical waste (Hashmi and Shahab 2003). Medical waste also becomes hazardous sometimes due to infectious agents such as chemicals, sharps, genotoxic and radioactive substances (Pruss-Ustun, Giroult et al. 1999). There is lack of environmental education regarding hospital waste management and thus it has become the main issue. In Pakistan, there is also an absence of knowledge about hospital waste management (Ehrampoush and Moghadam 2005).

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Based on the review of literature, it was concluded that a through detailed observational study along with documentation of the selected facility HWM system as well as data collection from respondents based on the aspects of HWM will be carried out. The focused research methodology followed is shared below.

RESEARCH METHODOLOGY

In order to continue forward, the overall research process has been broken down in multiple phases and steps as shown below in figure 02

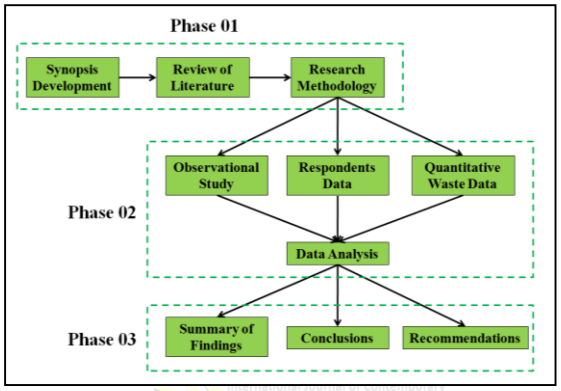

Figure 02 Phase-wise research program and major steps

The study project proceeded to the data collecting and analysis stage based on the stated research methodology and the examined review of literature. Here the foremost aspect was to define and develop a data collection tool which could be used for both observational study and later for data collection from the end users and the facility respondents in the form of visitors, patients and allied. The sampling technique applied was purposive sampling. Sample size was to be 40 and above. Total respondents size was 46. Purposive sampling helped identified the key aspects and highlighted categories to select human resources from and then opt for data collection.

OBSERVATIONAL STUDY, DATA COLLECTION & ANALYSIS

Based on observations and respondents data discussion with the respondents from AIMS hospital various points were noted. Based on the observational checklist as shown below in table 02, major reservations were noted as shown below:

Table 02 Observational Checklist

Observational study checklist		
S.No	**Activities / Questions**	**Answers**
1	Is there any Hospital Waste Management (HWM) system used in the explored facility ?	There was a defined system. The system mainly identified multiple key role players with respect to the overall waste collection. Later its ownership was reluctant to be observed to be owned by any one.
2	Was the policy / procedure and definitions displayed ?	It was not displayed any where in the facility except multiple displays to avoid spread of waste was displayed.

3	Were the people aware of the current policy and strategies used in HWM?	With respect to most of the end users including workers and the staff, no proper protocol was seen to be followed.
4	Is there a HWM team with designated roles and responsibilities developed?	Since no major system was identified, major gaps were observed since only lower staff was engaged with the waste collection and later was also observed that they were the main key players in its management and treatment.
5	IF yes to above question, do they have regular waste management progress review meetings?	No such data was available while researcher explored through staff and medical teams. However there was one register available on which one can write complaint related to waste management. Deputy MS would review the case.
6	Are all departments generating waste part of the team?	Information was not available.
7	Is there any defined HWM plan developed and displayed for all stakeholders?	There would have been a policy and plan but unfortunately neither it was displayed at any time nor it was available with any resources in the hospital.
8	As per EPA Waste Management Guidelines, are the following followed?	
8a	Waste Collection facilitation & bins	Limited bins were displayed and all major categorization was completely missing.
8b	Waste segregation	Missing.
8c	Waste collected temporary storage	Was done outside the hospital premises prior to burning or removal of waste.
8d	Waste transportation	No proper protocol or system was followed.
8e	Waste storage for treatment	No proper system was evident.
8f	Waste Disposal	Only small scale incineration was used but most of the waste was not treated and left mixed.
9	Are there any Reduce, Reuse, Recycle approach practiced?	No such policy was used in any process.
10	How regular is the HWM system inspections done?	During the research work, no inspection was observed to have taken place.

As discussed above in table 02, major issue were observed in the checklist completion. The waste produced includes sharps, infectious, pathological, chemical, pharmaceutical waste. The discrimination of risk waste and non-risk waste was not found at the hospital. Waste management inside the hospital is furthered discussed.

Segregation: AiMS hospital failed to maintain segregation of waste because of an absence of specific collection and disposal facilities. All wastes were disposed together in open containers and ground area around hospitals. Blood covered bandages and other related waste was not segregated from the general waste as shown in figure 03 below.

Figure 03 Blood covered bandages mixed with the general waste

Human body parts, placentas and other pathological wastes generated in operation theatres segregated and dumped in an underground tank having an open face as shown in figure 04 below.

Figure 04 Operation theatre waste in an underground tank

Segregation of sharps was another issue noticed, as there was no sign of sharps or needle destroyer being used. The syringes were found with intact needles in the waste container after being used as shown in figure 05 below.

Figure 05 Syringes with the general waste in a waste container

Segregation in hospital is not carried as per global standards. It is because of an inadequate management practices and absence of proper disposal facilities which is shown in figure 06 below.

Figure 06 View of an open dumping of waste

Labeling: There was a lack of color- coded waste containers is hospital as shown in figure 07 below.

Figure 07 Inappropriate Use of Color Coded Containers at selected Hospital

Collection: The type of containers used were simple plastic buckets and unlabeled waste bins, except for the red colored bin used for infectious waste. The workers collected the bins as required and dispose of on the dumping ground nearby the hospital. From the dumping ground of hospital as told by the respondents the municipal committee picks up the waste and dumps it into the landfills where all other waste from the city are dumped collectively as shown in figure 08 below.

Figure 08 The unlabeled collection bin used in AiMS

Handling: Sanitary workers with naked hands handled waste bags and were not properly protected. Personal protective equipment such as heavy duty-gloves and boots were not used as displayed in figure 09 below.

Figure 09 A waste worker from Hospital without proper clothing and protection.

Storage: The storage options were not present there as there was only the temporary storage in the waste bins which is only shifted to the open dumping site outside the hospital. The waste was directly dumped alongside the general waste without any specific discrimination/ segregation of the waste. In addition it was also observed that the hospital lacked a contingency plan for storing the risk waste as it was evident that all type of waste are dumped collectively as shown in figure 10 below.

Figure 10 Open dumping ground for hospital waste outside selected Hospital

Treatment and Final Disposal: As discussed earlier there were no proper segregation of waste type and any proper handling and storage, ultimately the final treatment and disposal measures were also found to be inadequate.

Burning: As for the disposal of sharps a metallic rusty burner was put besides the dumping ground near the hospital. After being burnt the ashes are dumped alongside the general waste in the dumping area as depicted in figure 11 below.

Figure 11 An old rusty burner used for burning sharps used instead of an incinerator

Incineration: There were no signs of incineration found. Upon questioning the respondents it was found that an incinerator was present at the hospital which was donated to the hospital, but it was not in use as there was no one who could operate the incinerator.

Landfill: The waste is collectively dumped at the ground nearby the hospital and later the municipal committee picks up this waste and dumps it into the larger landfills of the city alongside the general wastes of entire city as shown in figure 12 below.

Figure 12 An open dumping for anatomical waste clearly depicting inappropriate disposal

Workers: In hospital premises, workers were working under very poor conditions. Safety measures taken during collection, on-site transportation, off-site transportation and final disposal were poor and inadequate. Waste workers and hospital personnel were not protected against inherent hazards of hospital waste and chance of exposure to risk was very high. Personal protective equipment such as gloves and boots are completely unavailable as shown in figure 09 above.

Second methodology component used to collect data was from multiple respondents in the hospital zones related to waste management practices using a questionnaire which evolved through the observational checklist. For this purpose, different staff members involved with the waste and its management was interviewed. Details of the respondents are shown below in table 03:

Table 03 Respondents Demographics

Respondents Demographics			
S.No	**Typology**	**Count**	**%**
1	Support staff	28	61%
2	Medical team	3	7%
3	Admin	5	11%
4	Management	2	4%
5	Waste external staff	8	17%
6	**Total**	46	100%

As shown above in table 4.2, major representation was from support staff engaged with hospital waste management practices i.e. 61% followed by 17% of external waste related staff / resources involved in the waste removal and waste processing related to burning etc outside of the organization. With respect to respondents data collected based on the activities related to HWM planning, strategies, teams and allied aspects, table 04 is shown below:

Table 04 Respondents data related to HWM planning, strategies and actions

S.No	Questions related to HWM plans, activities, actions and strategies	Yes	%	No	%	Not Sure	%
1	Are you aware of any Hospital Waste Management (HWM) system used in the explored facility ?	14	30%	26	57%	6	13%
2	Have you seen the HWM policy / procedure and definitions displayed ?	12	26%	34	74%	0	0%
3	Are you aware of the current policy and strategies used in HWM?	12	26%	31	67%	3	7%
4	Are you aware of any HWM team with designated roles and responsibilities developed?	14	30%	26	57%	6	13%
5	IF yes to above question, do they have regular waste management progress review meetings?	8	17%	36	78%	2	4%
6	Are you aware about all departments generating waste part of the team?	5	11%	40	87%	1	2%
7	Are you aware of any defined HWM plan developed and displayed for all stakeholders?	12	26%	30	65%	4	9%

As shown above in table 04, majority of the respondents were unaware of the existing Hospital Waste Management plans and actions. They have been advised by the management to have multiple roles and as per need their roles and actions do get revisited again and again. Major values are shown below in figure 13.

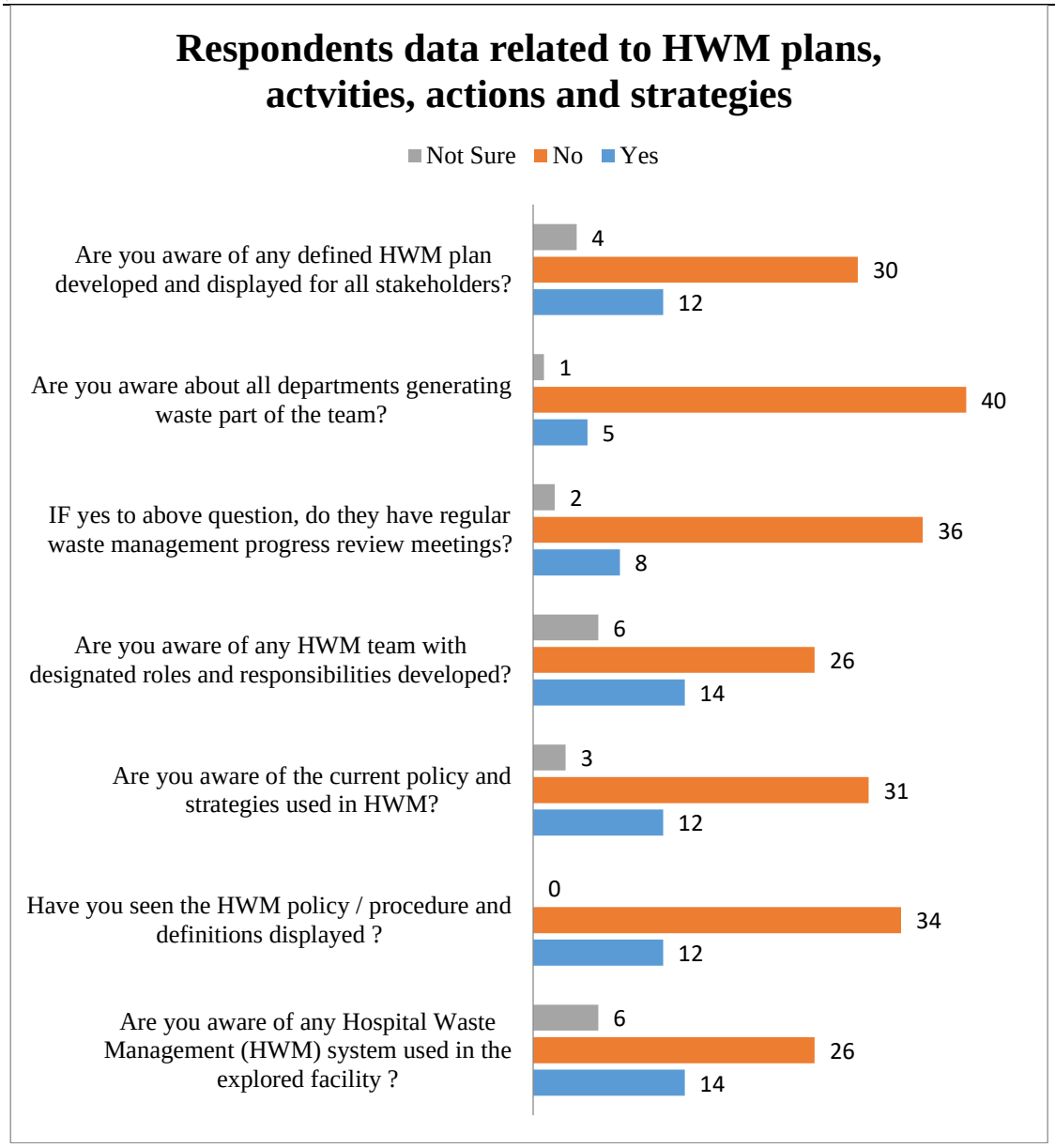

Figure 13 Respondents data related to HWM plans, activities, actions and strategies

As shown above in figure 13, 57% respondents were not aware of any HWM system used in the existing facility, 74% respondents have not been aware of the any display of HWM plan or functions, 67% were not aware of the current policy, 57% were not having awareness about the team based designated roles and responsibilities, 78% have not been able to participate or aware of any HWM progress review meetings, 87% do not know if all the departments have been engaged in the waste management team and 65% are unaware about the current HWM plan and where its has been displayed. The above figures showed a major gap in the communication as well as strategic role of the HWM being ignored in the existing practices. With respect to respondents satisfaction based on the EPA guidelines were explored for multiple activities of the HWM practices. Collected data is shown below in table 05:

Table 05 Respondents satisfaction with multiple activities of HWM

8	Respondents satisfaction with multiple HWM activities	Highly Unsatisfied	%	Unsatisfied	%	Neutral	%	Satisfied	%	Highly Satisfied	%
8a	Waste Collection facilitation & bins	32	70 %	7	15 %	4	9%	3	7%	0	0 %
8b	Waste segregation	22	48 %	15	33 %	8	17 %	1	2%	0	0 %
8c	Waste collected temporary storage	21	46 %	11	24 %	10	22 %	4	9%	0	0 %
8d	Waste transportation	10	22 %	16	35 %	10	22 %	8	17 %	2	4 %
8e	Waste storage for treatment	22	48 %	9	20 %	10	22 %	4	9%	1	2 %
8f	Waste Disposal	26	57 %	11	24 %	8	17 %	1	2%	0	0 %

As shown above in table 05, most of the ranking and values of the activities part of the HWM practices were falling in the either highly unsatisfied or Unsatisfied category. The grey highlighted areas in the table show the major values or share of the overall respondents. As evident from the table above, major high values fall into the highly unsatisfactory or unsatisfactory category. The overall respondents felt there are major gaps in the existing system and its operationality with respect to EPA guidelines explored. With respect to question related to 3R i.e. Reduce, Reuse and Recycle in HWM, all of the respondents believed its not practiced and has not been part of the system. With respect to inspection, only admin respondents stated that they have recently seen one such activity during the COVID19 timeline while most of the hospital was closed. Based on the respondents data, a further session was done along with data collection to have discussion with them. The results are shown below in table 06.

Table: 06 Respondents data discussion involved with the waste and its management

Questions	Categories of major waste generation	Available waste disposal facilities in AIMS?	Treatment facilities available for the generated waste
Outcome of discussion	General non-risk waste alongside the risk waste which includes used syringes, blood covered bandages, waste from labor room including cut placentas and blood and other pathological wastes.	Unlabeled waste containers and a common dumping site.	The only treatment method for the waste is burning the sharps in a burner instead of an incinerator while the ashes produced are dumped alongside other general waste. And that the waste from this site was supposed to be collected by municipal authority.

There are no clear guidelines for the safety and management of health care workers and no standardized segregation procedures are applied in hospital. The labeling system is not applied (no proper bag holders, no yellow polyethylene bags or High deficiency Polyethylene Bags, proper waste containers etc).The health workers are uncertain about the definitions of medical wastes. No WHO

precautionary principle is applied. The lack of fundamental hygienic measures increases the chances of the risk of transmitting contaminations. The above findings clearly suggest that EPA and WHO guidelines are not followed. These guidelines are either completely ignored or not followed properly. There is no regulation for management of health care workers, and no standardized segregation procedures. The labeling system is not applied due to an absence of equipment (no proper bag holders, no yellow polyethylene bags or high deficiency polyethylene bags, proper waste containers etc.).The health workers are unclear about the definitions of terminologies of medical wastes, thus using unmarked bins. The WHO precautionary procedures are not followed along with EPA guidelines.

DISCUSSION

In order to implement an optimal waste management strategy at AIMS, the gaps identified in the current practices of the AiMS needed to be filled by following the EPA HWM guidelines. This can be achieved by observing few things and in compliance with the EPA HWM guidelines. Before clear improvements can be made with healthcare waste, definitions of management, composition and scientific basis of medical waste should be established, covering all their components, as well as objectives and means to manage them. Additional goals can also be incorporated such as environmental protection and cost reduction. To establish a clear definition of the types of waste will allow the developing of a reliable solution. Proper segregation of wastes should be achieved through clear standards, and strict controls. It will result in only a small portion of the waste generation that requires a special treatment. If proper handling of sharps is introduced in all facilities of hospitals, much of the risk associated with waste handling can be abolished. These comprise appropriate equipment for sharps (needle cutters and needle boxes), collection system for its transport and its disposal mechanism. Moreover, capacity building training for the relevant staff to handle and manage sharp objects. There is also a need for greater emphasis on the minimization of hazardous waste generation. For an instance, implement of policies that eliminate the use of mercury-containing products. This reduction policy will go a long way towards cleaning up the hospital waste. Appropriate education and training for all workers, from doctors to room attendants, housekeeping staff and rag pickers to ensure they understand risks posed by waste and how to protect themselves from them. Moreover, there is a need for provision of personal protective equipment to the staff dealing with waste collection and handling. There is a need of clear plans and policies for proper waste collection, management and disposal. It should be incorporated into day-to-day employee training, ongoing learning, and waste assessment processes. There is need for an investment in capacity building of staff and provision of required equipment as well as inculcation of culture of recycling equipment and materials for reuse at AIMS. Administrative authorities of hospital should support measures aimed at promoting reuse and recycle culture. The AIMS hospital had no observable hazardous waste management, recycling, recycling or disposal capacity. Due to the lack of hospital waste sorting practice, many of these hazardous materials are disposed of in a nearby landfill where they are stored, potentially posing another threat. The relevant infrastructure should be constructed for the disposal and recycling of waste.

RESEARCH FINDINGS & CONCLUSIONS

The existing practices at AIMS were found to be unsafe and have harmful environmental impacts. Clear violations of EPA guidelines were evident in the results discussed. This is mostly because of absence of proper facilities, equipment and waste management plan. In order to propose an optimal strategy for waste management at AIMS, the development of appropriate financial means and implementation of waste management plans will be primary factors implementation of health-care waste management plan at hospital.

In order to implement an optimal strategy at AIMS, a lasting commitment of hospital authorities and government are required along with other sustainable approaches discussed further below;

1. The regularity of practices for managing medical facilities and management measures. The processes should be as per the guidelines of EPA HWM Rules 2005.
2. Strengthening the capabilities of the authorities involved in management process through their capacity building in form of training programmes.

3. The development of a sustainable surveillance plan, which includes inspections and accompanying measures, to help health authorities to strengthen the implementation of safe practices.

After the conclusion of study, it is quite evident that the clear violations of EPA HWM guidelines are being practiced at AIMS. The existing waste management practices at hospital are a clear threat to environment and public health. The non-availability of waste management facilities and policies are the major gap to the concerned objective. Therefore based on the results and gaps identified, a few recommendations are proposed to implement an optimal waste management strategy for the AIMS. These recommendations aim to bring positive changes and moving towards an optimal waste management practices for the AIMS hospital, which are currently a clear threat to environment and public health.

PROPOSED RECOMMENDATIONS

Few recommendations are made in order to propose an optimal waste management practices at AIMS. These recommendations aim to provide a pathway to follow EPA HWM guidelines and moving towards an optimal waste management strategy. These are summarized in the following points.

1. Clear definition of the problems related to HWM practices at the AIMS hospital
2. Focus on segregation of waste as an approach to its management
3. Establishment of sharps management system for the proper disposal of waste
4. Prioritized focus on a reduction of hazardous material waste
5. Personal protective equipment to the staff dealing with waste collection and handling
6. Implementation of policies of EPA hospital management guidelines
7. Investment in capacity building of staff as well as provision of required equipment
8. Infrastructural development for the disposal and recycling of waste

Following timeline based provisions are proposed for actions:

Table 07 Timeline based actions

S.No	Term / Phase	Actions needed
1	Immediate	1. Provide separate bins for all major hospital waste types. 2. Provide signage and follow-up guidelines. 3. Train the people to follow the guidelines. 4. Develop guidelines and system integration. 5. Develop guidelines through graphics and in both English and Urdu. 6. Develop an inspection and overview schedule. 7. Incorporate inspection team.
2	Short term	1. Integrate all departmental representatives for the HWM system in AIMS. 2. Evaluate the infection control strategies and line of actions for managing different functional spaces within the hospital. 3. Designate the departmental functional zones for each department with coding them for different strategies. 4. Align these implementation policy with regard to hospital WM policy and guidelines.
3	Long term	1. Design and implement Incinerator for the hospital. 2. Manage and develop specific budget for the HWM system. 3. Designate specific roles related to HWM.

It is evident based on the research exploration that epidemics and pandemics have strongly impacted the HWM systems. There is strong need that people in general and specially people serving in healthcare facilities be well equipped and trained with respect to HWM systems and managing the risks associated with the poor management. A string role is also proposed with respect to media where these issues

not only need to be highlighted but also help sensitize the people in general. Evidently with poor sensitization, people in general are at risk due to spread of infections and diseases and have already caused harm at large scale across the globe.

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