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Corporate Liability in Healthcare Waste Mismanagement: An Assessment of Regulatory Failures in Hospitals of Khyber Pakhtunkhwa

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ABSTRACT
Health care mismanagement in terms of waste management is a major issue in developing countries, where it has not received satisfactory focus despite being classified as infectious. When such neglect is attributable, it constitutes corporate misconduct due to nonfulfillment with legal and public health obligations. The aim of this research study is to analyse the compliance status with the HWM Rules 2005 to identify the underlying reasons of overall mishandling and malpractices of healthcare waste management in Khyber Pakhtunkhwa. Drawing on primary data, the study finds that the inadequate applications and discrepancies in the overall system of the waste management. The study also identifies that the lack of awareness of the HWM 2005 rules among nurses and paramedical staff and administration regarding waste handling constitutes corporate misconduct which is hazardous for public health. On the administration side, the lack of proper monitoring and supervision system has further aggravated the situation. The findings suggest improvements in the management of healthcare waste in Peshawar as well as in overall Khyber Pakhtunkhwa.

Keywords: Hospital Waste Management, Segregation Practices, Environmental Health, Human Safety, Corporate Liability

Introduction

Inadequate handling of health care waste is a significant issue in developing countries. Healthcare waste refers to the waste produced during healthcare activities, including sharps and non-sharps, blood, body tissues, chemicals, pharmaceuticals, medical equipment, and radioactive substances (Aziz, Omar, Halim, & Hung, 2022). In developed countries, the guidelines to be followed to dispose of health care waste are based on the World Health Organization (WHO) standards. In some developing countries there is no specific legislation or regulation in place for health care waste management and in some other countries they have just basic regulation in health care waste management, but they are not following the standard world health organisation (WHO) guideline. Therefore, if the hospital wastes are not properly disposed of, it may be harmful to human health and environment. Waste at health care facilities represent a potential source of infection and a risk to the healthcare worker, the patient, waste handlers, scavengers and the general public, particularly the sharps (Aziz et al., 2022).

Research in Pakistan, as in other developing countries has shown that waste management in Pakistan is not effective. In Pakistan, insufficient handling and disposal practices in medical facilities persist because key stakeholders in the health sector have given limited priority to this critical environmental and public safety issue (S. Ali et al., 2015). Currently, there are very basic laws in Pakistan relating to healthcare waste management. The legislation and regulations were somewhat less liberal in the past 30 years. Previous

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research work has highlighted many causes for this poor management, for instance, lack of knowledge by hospital staff, lack of interest by administration, no proper trainings and no supervision (M. Ali, Wang, Chaudhry, Geng, & Ashraf, 2017; S. Ali et al., 2015).

The healthcare needs have increased due to the rapid growth of population and urbanization in Pakistan. As a result, healthcare facilities generate various categories of dangerous and contagious materials, including pathological matter, pharmaceutical and chemical residues, and radioactive substances. These materials can seriously threaten both public well-being and the natural surroundings. Because of their harmful nature, safe handling and disposal of medical refuse is considered an essential component of an effective waste control framework. Environmental pollution due to improper disposal of hospital wastes such as smell, breeding of insects (flies, mosquitoes and worms) and transmission of human diseases (cholera, typhoid, hepatitis B, hepatitis C, HIV/AIDS) due to the pollution of the environment (M. Ali, Wang, Chaudhry, Geng, et al., 2017).

This research study focused on the implementation of Waste Management Rules (2005) and compliance of the healthcare staff of hospitals of Peshawar, KP with these rules. The capital of Khyber Pakhtunkhwa Province is Peshawar. Peshawar has well-known and good hospitals both public and private. Some studies were conducted in last 10 years which are focused on various causes and effect of waste management in hospital on human health and environment but none of the studies has been conducted to study the status of waste management, practices of waste management rules 2005. The present research study will attempt to investigate the status of implementation of hospital waste management (HWM) Rules 2005 and will try to assess the root cause of the overall mismanagement and malpractices of waste management in healthcare institutions of K.P.K.

This study may assist policymakers in revising and improving the current regulations related to medical waste disposal by incorporating practical challenges and aligning them with the standards and recommendations of the World Health Organization. The findings could also support healthcare institutions in strengthening the enforcement and supervision of the Hospital Waste Management Rules 2005. Effective application of these regulations can further reduce risks to community health and protect the environment from harmful impacts.

Literature Review

Hospital waste management (HWM) is a serious element of healthcare systems because hospitals generate both hazardous and non-hazardous waste during diagnosis, treatment, and patient care activities. Studies show that approximately 75–90% of hospital waste is similar to municipal solid waste and is generally considered non-hazardous, while about 10–25% consists of infectious, chemical, and sharps waste that poses serious risks to human health and the environment if not properly managed (Zeeshan et al., 2018).

In general, there are four terms used, all of which are often used interchangeably when talking about hospital waste: hospital waste, medical waste, regulated medical waste and infectious medical waste; none of which is universally accepted to have a specific definition for each (M. Ali, Wang, Chaudhry, & Geng, 2017; Chaerul, Tanaka, & Shekdar, 2008). Differences between areas/countries in definition of hospital wastes may be possible. The challenge in a comparative perspective is lack of an internationally agreed upon definition of medical waste, which makes it difficult to make a comparison on medical waste production on a country/regional level, even within countries as medical waste is a changing concept with different definitions. No special regulation is available in medical waste sector; it has been added to the general regulation of wastes.

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This study takes the concept and definition of waste management of the World Health Organization (WHO) will be accepted as the norm. World Health Organisation (WHO) defines the term healthcare waste, "Healthcare waste consists of all waste generated in healthcare facilities, research centres and laboratories associated with medical procedures, as well as the same categories of waste from minor and scattered sources, such as waste from health care performed at home (e.g., home dialysis, self-administration of insulin, recuperative care)" (WHO, 2024). Most of the material discarded by medical institutions resembles ordinary household refuse and is classified as general or non-risk healthcare waste. This category constitutes approximately 75% to 90% of the total waste produced by healthcare facilities (Prüss et al., 2014). As there is a potential of high risk on human health and environment to the hospital waste management, it is essential to have specific knowledge and regulations.

Based on the recommendations by the World Health Organization (WHO), they have provided certain basics in health care waste management which is safe and sustainable (WHO, 2024). According to the principles of the World Health Organization, the financing and management of healthcare services should include adequate provision for the costs associated with waste management. The manufacturers also have to assume the responsibility of considering waste management in the design and marketing of their product/service. In other developing countries (Nepal, Bangladesh and Maldives) there is no basic legislation for managing healthcare waste (HCWM) whereas in Pakistan there is legislation. There has been a slight improvement in legislation and regulation in the last 30 years. The Pakistan Environmental Protection Ordinance (PEPO) 1983 was the initial legal structure introduced to set up federal and provincial Environmental Protection Agencies (EPAs) along with the Pakistan Environmental Protection Council (PEPC) (Hassan, 1996). However, it did not provide specific guidelines for managing healthcare waste. Later, the Pakistan Environmental Protection Act (PEPA) 1997 replaced the 1983 ordinance and offered a more comprehensive legal framework for environmental management, including healthcare waste management (Z. Mukhtar, 2023). While the 1983 ordinance mainly addressed general environmental pollution, the 1997 act expanded its scope by defining hospital waste and outlining procedures for handling hazardous materials (Dawar, 2017).

On 3rd August 2005, under the provision of Pakistan Environmental Protection Act (1997), section 31, Federal Ministry of Environment issued notification, to add the new rules for hospital waste management (HWM) as standard. These rules have been said to be as Hospital Waste Management (HWM) Rules, 2005 and will be applicable from its publication date. The guidelines provide detailed coverage of all key elements involved in safe hospital waste management across the country. These include the formation of waste management teams within healthcare facilities along with their responsibilities, as well as procedures for the segregation, collection, transport, storage, and disposal of hospital waste. They also outline the use of appropriately designed containers, colour coding systems, and methods for identifying and managing risks associated with healthcare waste (Mahar et al., 2007).

Infectious healthcare waste must be properly treated before final disposal. The purpose of this treatment is to reduce the possible risks associated with medical waste and to help safeguard both human health and the environment (Prüss et al., 2014). In medical waste, proper waste segregation can also help to reduce the waste, for instance in China, typical medical waste is about 10% food waste (Yong, Gang, Guanxing, Tao, & Dawei, 2009). Incineration method, although it has some advantages such as; reducing the volume and weight of waste materials, sterilizing and detoxifying waste materials, recovering of

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heat/electricity etc., but also has some disadvantages including; emission of toxic gases/substances to air, high operation and maintenance cost, high initial investment and proper disposal of solid ash residues is necessary which requires trained personal etc. (Team, 2015). Another way is the hospitals' replacement of the old technologies with the new one; this can also play a role in waste reduction. Some of these efforts have recently been implemented in several hospitals in the Kingdom of Bahrain such as replacing the traditional blood pressure machine with a digital machine and replacing the X-ray film with digital machines, and show positive aspects.

Research Methodology

This research was conducted using qualitative methodology. Qualitative research is a "interpretive approach providing thorough interpretation of social phenomenon including its meaning to those who experience it" (Dey, 1993: 2). Peshawar hospitals were selected as case studies to see the practices of the waste management. A total of 2 hospitals: Lady reading hospital and Hayatabad Medical Complex were selected to see how they implement waste management rules 2005.

Respondents were interviewed based on purposive samplings (Rai & Thapa, 2015). While using purposive sampling, the researcher decides what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience (Etikan, Musa, & Alkassim, 2016). Key respondents include government officers, hospital administration, nurses and local doctors. In purposive sample a setting, person or activity is chosen purposefully to provide information which is relevant to the researcher goals and objectives. Some choose topics due to their special skills or knowledge of a particular group, and choose topics representative of this group (Berg & Lune 2012).

For this research study data was collected data through semi- structured interviews. "The semi standardized interview can be located somewhere between the extremes of completely standardized and the completely un-standardized interviewing structure" (Berg & Lune, 2012: 109). In semi-structured interviews "question may not follow the exact pattern as it outlined" (Bryman, 2008: 438). In total 15 respondents were interviewed including 11 male respondents and 4 female nurses for this research study. At the beginning of each interview, I introduced myself as researcher and objective of the research. After every interview, I converted the data in proper form. During the data management, I focused and re-focused on the theme of my research and always asked the question: whether the data I am getting will answer the research questions of this research study. I first noted down the data on note book where I was not allowed to record it, afterward, I wrote it in personal computer to make it safer and clearer. A separate file was made for each interview which was later put together (discussed in analysis part) into one file in more organized form according to research questions and chaptalization of the research study. To abide by the ethics of research, I took verbal informed consent from the respondents and asked them if they want to keep their names confidential in the research. Due to the sensitivity of the topic, respondent's names are kept anonymous in the research. Secondary data for this research included government publication, articles, census reports, historical records, books.

Findings and Discussion

The Hospital Waste Management Rules 2005 are made under Section 31 of the Environmental Protection Act, 1997 of Pakistan to deal with the safe and environmentally responsible management of medical and hospital waste within the

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country (Zeeshan et al., 2018). The Hospital Waste Management (HWM) Rules 2005 were introduced to ensure the safe handling and disposal of healthcare waste in hospitals and other medical facilities (Government of Pakistan, 2005).. These rules provide a broad legal structure for managing different types of hospital waste, including general, infectious, sharps, pathological, pharmaceutical, and chemical waste (S. Mukhtar et al., 2018). The main focus of the rules is on proper segregation at the source, safe collection and storage, secure transportation, effective treatment, and environmentally sound disposal of hazardous waste (Arshad, Nayyar, Amin, & Mahmood, 2011). Hospitals are required to use color-coded containers for segregation, maintain proper storage areas, and ensure that infectious waste is treated through approved methods such as incineration before final disposal in secure landfills (Government of Pakistan, 2005). The rules also emphasize the importance of staff training, awareness programs, and proper documentation to ensure accountability and compliance. Regulatory authorities, particularly the Environmental Protection Agency, are responsible for monitoring implementation through inspections and enforcement actions (Government of Pakistan, 2005).

The Hospital Waste Management Rules, 2005 provide the classification of healthcare waste into various categories based on its potential for harm and infectiousness (Zeeshan et al., 2018). The HWM 2005 rules reflected the World Health Organization guidelines from establishment of a facility based waste management plan (detailing the assignment of responsibilities, management structure, and duties) to effective regulation of onsite collection, segregation, handling, labelling, storage, transportation and disposal of healthcare waste (Zeeshan et al., 2018). The HWM Rules 2005 make it mandatory for every healthcare facility to establish a waste management team.

Segregation Practices for Healthcare Waste

The segregation of waste management is a significant issue with far-reaching effects on the environment and public health. During the field work it was found that there were no points of segregation of waste in the hospitals. Entire waste is dumped in one place. Respondents explain that there is one colour of plastic bags used for the collection of waste in the hospitals. Various problems relating to segregation of waste at point source, unsuitable collection, transportation, storage place, and disposal were marked first through direct observations, and later mentioned by the respondents. Respondents explain that we receive only one colour and sweepers collect the waste on one bag from all the wards. They collect only once daily without segregating them and without proper protective protocol. Respondents further illustrated that patient also use the same dust bins for the thrash.

It is noted that there is no separate colour coding concept of waste segregation even in the understudy hospitals. Respondents further explain that there is no concept of colour coding in the hospitals. A small plastic container placed beneath patients' beds in the wards is used for disposing of all types of waste, including sharps and infectious materials generated by nursing and paramedical staff, as well as general refuse and food leftovers produced by patients and visitors (Dawar, 2017). Workers do not have the proper Personal Protection Equipment (PPE) when collecting the waste. All health care waste is kept in one large plastic bag, put into a large waste bin which is then taken to the open storage area and incinerator (Dawar, 2017), It is also noted that the concerned staff didn't know about the waste management rules 2005, and even couldn't differentiate the hazardous material in the hospitals. Moreover, they do not follow the WHO rules of safety.

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Management of Waste Storage, Transport and Disposal Sites

Management of waste storage is huge issue in developing countries. Incineration has been used widely for disposal of hazardous wastes that cannot be reused or recycled and cannot be disposed of safely in a landfill because of excessive toxicity or risk of infectious transmission (Varshney, Singh, & Yadav, 2022). This technique allows for significant volume reduction and varying magnitudes of toxicity reduction in the hazardous waste being treated. The other disposal options include land disposal, underground disposal, deep well or underground injection, aqueous organic treatment and landfill and surface impoundments (Varshney et al., 2022).

Well-organized categorization of healthcare waste by healthcare centre facilities helps to avert and minimize the mixing of dangerous waste with general waste, which may lead to the waste stream being contaminated (Mmereki, Baldwin, Li, & Liu, 2017). Sorting of waste was not commonly practiced in the hospitals of Peshawar. There is no proper apparatus for the transportation and disposal sites for the hazardous hospital waste. Disposal sites are near the densely populated areas without proper labelling. Most often they burnt the waste. There is no proper storage or in site transportation practices in the hospitals. Consequently, the stray dogs and birds and children have easy access to hospital waste. According to the hospital administration that waste is incinerated every week in open spaces to minimize the environmental hazards. Moreover, the hospital administrator also explains that hospital do not own separate staff for this, usually these tasks are outsourced. It is also noted that storage rooms themselves were not in good condition, and plastic bags comprising waste were put on the ground. Often, there were leakages on the floor from plastic bags containing medical waste, which could be a source of ecological danger.

During an interview, the sub-contractor argued that there is no such facility for the disposal of incinerated ash. The ash is disposed of in the open dump site. In all the healthcare facilities, reprocessing of any segregated wastes is not currently being practiced on-site. According to the WHO, if health care wastes are not disposed of in an environmentally protected open dump or landfill, they could pose a potential health and environmental hazard.

Weak Monitoring and Control Mechanism

A weak monitoring and control mechanism in hospital waste management can lead to severe environmental and public health risks. In many healthcare facilities, the absence of regular monitoring, supervision, and vibrant accountability results in the inadequate segregation and disposal of medical waste (Tsakona, Anagnostopoulou, & Gidarakos, 2007). Staff members may not follow standard waste management procedures due to insufficient training and lack of enforcement of regulations. Moreover, insufficient record-keeping and limited supervision systems make it difficult to control waste disposal practices efficiently. Strengthening monitoring and control mechanism are essential to ensure safe and efficient hospital waste management (Bdour, Tarawneh, Al-Momani, & El-Mashaleh, 2015). During the field work it was noted that there is no proper check and balance system to monitor and supervise the hospital waste management. During an interview, Environmental Protection Agency (EPA) refers to the malpractices and disclosed their failure to monitor the installed incinerator as well the dumping sites. He further elaborated that due to non-availability of funds they are unable to implement their rules and regulations regarding the incineration emission, off-site transportation, management of incinerated ash and residues disposal and infectious waste

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landfill dumping.

Respondents further highlight the anomalies in the system. EPA employees explain the lack of accountability in the overall process of waste management. They explain that there is limited check on incinerators installed, transportation and final disposal method. They do not follow the EPA and the HWM rules and even the staff is not aware these rules and regulations. EPA director and inspectors also confirmed that there was no government appointed dump site for incinerated ash and residues and infectious waste of healthcare. He further elaborated that it is planned to install three new waste dumping facilities, but he was not sure when and where. During an interview, the sub-contractor explains that the present dumping ground of the waste is Ring Road of Peshawar and has been named as ring road waste dumping site. EPA inspectors do not conduct regular inspections of waste disposal sites to ensure that unauthorized people, animals, or birds cannot access the area and that the site remains safe for waste dumping. They usually inspect the site and take necessary action only after receiving complaints regarding improper waste management practices.

During an interview, the Director of the EPA argues that the agency aims to introduce revisions to the Hospital Waste Management (HWM) Rules 2005. When questioned about the nature and extent of these proposed amendments, including whether they would involve significant or only minor modifications, he responded that the details had not yet been finalized. However, he indicated that some changes are expected, although they are unlikely to be substantial. Despite these intentions, the EPA has not undertaken any formal revision or amendment of the HWM Rules 2005 over the past seven years. It is intended to introduce rules for punishment in case of violations.

Staff Awareness and Training

Staff consciousness and training play a important role in effective hospital waste management. Healthcare workers, staff, and waste handlers must have suitable information of waste segregation, collection, transportation, and disposal procedures to reduce health and environmental dangers. In many hospitals, insufficient training and limited awareness regarding hospital waste management guidelines result in indecorous handling of perilous waste (Madhukumar & Ramesh, 2012). Healthcare workers may fail to differentiate between infectious and non-infectious waste, leading to insecure disposal practices and increased chances of pollution and disease transmission (Madhukumar & Ramesh, 2012). The Health workers and staff had a limited knowledge and training regarding the waste management rules 2005. Many of the respondents argue that they didn't know about these rules. When the concerned staff members were asked about training related to hospital waste management, they stated that they had neither attended any formal training sessions nor had any such programs been organized by the hospital management.

The absence of regular training and awareness programs reflects a lack of institutional focus on safe waste handling practices. As a result, many staff members may not fully understand proper waste segregation, collection, storage, and disposal procedures. This lack of knowledge can contribute to improper waste management practices, increasing the risk of infections, occupational hazards, and environmental pollution within and outside the healthcare facility. All interviewees acknowledged that the issue of improper waste segregation mainly arises from the lack of comprehensive training and awareness among medical staff as well as supporting workers, including sweepers and ward servants (Khalid et al., 2021). Due to insufficient training, many staff members are unable to follow standard waste segregation and disposal procedures correctly, which

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negatively affects the overall waste management system in hospitals.

Similar study has been conducted by Arshad et al. 2011 (Arshad et al., 2011) and concludes that there is lack of awareness of the management regarding detailed laws and regulations governing health care waste management. Khalid highlights a serious public health and environmental crisis. Because front-line workers and hospital administrators lack proper awareness, hazardous medical waste frequently gets mixed with general waste or is openly dumped (Khalid et al., 2021). These poor management practices are not only due to the lack of interest from the hospital management team or lack of awareness concerning health risks, but also due to the economic issues in implementation of healthcare policy from the government (Khalid et al., 2021).

Conclusion

Hospitals provide vital healthcare services, but these activities generate both perilous and non-hazardous waste. Safe healthcare waste management is essential for environmental protection and human safety. The main objective of this study was to examine the actual implementation of healthcare waste management regulations and identify gaps and malpractices in waste handling practices in both public and private hospitals in Peshawar, the capital city of Khyber Pakhtunkhwa. Hospitals were selected based on factors such as bed capacity, patient load, number of departments, and daily visitors.

The findings revealed that healthcare waste management practices and the implementation of the Hospital Waste Management (HWM) Rules 2005 was weak in healthcare facilities n Khyber Pakhtunkhwa. Hospitals showed poor practices in waste segregation, onsite collection, transportation, incineration, and final disposal, which were not in accordance with the HWM Rules 2005.

Several factors were recognised as major reasons of poor waste management practices, including lack of government attention, weak monitoring and accountability systems, insufficient inclusion of healthcare waste management in medical and paramedical education, and limited awareness and training among hospital staff and administration. Nurses, paramedics, and waste handling staff lacked adequate knowledge regarding waste management procedures, while hospital administrations had limited understanding of the HWM Rules 2005. Furthermore, the existing monitoring and inspection system was considered ineffective and complicated, making accountability difficult for the Environmental Protection Agency (EPA).

The study recommends improving documentation and record-keeping systems related to healthcare waste for effective planning and management. Regular training and awareness programs should be conducted for all hospital staff, especially in public hospitals. The government should revise and simplify the HWM Rules 2005 to make them more practical and easily enforceable in both public and private healthcare facilities. Additionally, medical and nursing institutions should include a dedicated subject on safe healthcare waste management in their curriculum according to World Health Organization (WHO) standards. The EPA should strengthen regular inspections of waste disposal sites and establish separate landfill facilities for hospital incinerator ash and hazardous residues. Overall, an effective, transparent, and simple monitoring and accountability system is essential to improve healthcare waste management practices not only in Peshawar but throughout Pakistan.

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