Assessing Knowledge, Attitudes, and Practices of Healthcare Workers in Private Hospitals

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The effective management of hospital waste is gaining prominence in numerous developing nations, primarily attributed to its infectious and hazardous characteristics. This involves augmenting the capacity of existing healthcare facilities and the construction of new hospitals in both the public and private sectors. The research delves into the complex landscape of healthcare waste management in private hospitals in Khyber Pakhtunkhwa, specifically in Peshawar, Pakistan. The study meticulously explores the knowledge, attitudes, and practices of healthcare professionals, including doctors, nurses, and lab technicians, regarding the proper disposal of medical waste. The global context of healthcare waste is emphasized, underscoring the need for effective management to control infections and prevent the spread of diseases. The study identifies challenges in waste management, highlighting disparities between developed and developing nations in enforcing regulations and addressing issues such as inadequate knowledge and funding. The environmental and social impacts of improper medical waste disposal in Pakistan, particularly in densely populated urban areas like Peshawar, are discussed. The study reveals that the combustion of medical waste contributes to severe air pollution and associated health complications. Through a detailed examination of healthcare workers' knowledge and practices, the research identifies varying awareness levels among different professional groups, calling for targeted interventions to bridge gaps and improve waste management practices. The methodology and results analysis provide a robust foundation for future research and policy initiatives. The study advocates for enhanced healthcare waste management in the region to benefit the current population and safeguard the well-being of future generations. Doctors and nurses demonstrated higher awareness levels compared to paramedics and sanitary workers, aligning with similar findings in the literature. The research highlights the importance of regular supervision and training at all levels for proper and secure hospital waste management.

Keywords: Medical Waste, Infections, Waste Disposal, Sanitary Works.

Introduction:

Waste generated by activities in healthcare facilities encompasses a diverse array of materials, ranging from used needles and syringes to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices, and radioactive materials. Effective medical waste management is crucial to prevent the spread of diseases. In recent times, systematic and efficient step-by-step medical waste management has become a critical component in controlling healthcare-associated infections [1].

Hospital waste is categorized into hazardous and non-hazardous waste. The former includes pathological waste, infectious waste, sharps, pharmaceuticals, and genotoxic, chemical, and radioactive waste, constituting 10 to 25% of total hospital waste and requiring proper

disposal due to associated health risks. The latter, comprising 75% to 90% of hospital waste, is non-hazardous general medical waste comparable to domestic waste [2].

Globally, developed countries produce 1 to 5 kg of waste per bed per day. The waste generation rates in the U.S., UK, and Taiwan are approximately 7 kg/bed/day, 1.67 kg/bed/day, and 2.5 kg/bed/day, respectively. In Pakistan, the waste generation figure is 2 kg/bed/day, with 0.1 to 0.5 falling under the risk waste category, totaling around 250,000 tons of medical waste from healthcare facilities [3].

Addressing the issue of hospital waste management in Pakistan requires a multi-pronged approach, prioritizing awareness campaigns and training to provide basic protection and measures to those responsible for handling and disposing of medical waste. Developed countries mitigate the situation through the strict application of legal frameworks [4]. However, in poorer and developing nations, factors such as the lack of stringent rule enforcement, inadequate knowledge, awareness, and motivation, insufficient technological interventions, improper management strategies, and inadequate funds contribute to challenges in medical waste management [5].

Developing nations are increasingly grappling with the adverse consequences of environmental externalities, specifically air and land pollution. The fluctuations in solid waste, land pollution, and air pollution are attributed to various factors, including rising population density, diverse industrial activities, cultural norms, and the enforcement of laws and regulations. [6] highlights these challenges. In response to these concerns, the United Nations adopted Agenda 21 in 1992 as a strategic approach. The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro set specific objectives and goals for waste management. During the summit, it was agreed that by the year 2000, every nation worldwide would be mandated to establish regulations for waste disposal, treatment, and impact monitoring. Moreover, by 2025, every country must ensure that all waste, sewage, and wastewater are disposed of in compliance with global quality standards [7][8].

Pakistan, a developing country in South Asia with a primarily agrarian economy marked by low-income levels and rapid population growth, faces significant vulnerability to the adverse impacts of climate change. According to World Bank statistics, Pakistan ranks 12th among countries most affected by climate change. Waste-borne diseases claim the lives of 5.2 million people and 4 million children annually, while air pollution, a major health hazard, results in the loss of seven million lives each year [9]. From 1970 to 2010, global carbon emissions surged by up to 80%, with Pakistan currently contributing annual emissions of 407 parts per million, constituting around 0.7% of the global total. Causes of air pollution in Pakistan include vehicular emissions, industrial activities, coal-based energy generation, residential cooking, and waste burning in dumping sites [10][11].

The prevalence of social and environmental challenges is escalating, particularly in densely populated urban areas like Peshawar. Air quality in Peshawar is a significant concern due to its role in causing various health issues. The air quality index in Peshawar consistently exceeds 100 on average due to economic activities such as waste incineration, vehicular congestion, and industrial carbon emissions [12]. According to the World Health Organization, a healthy atmosphere should have an Air Quality Index (AQI) below 100. A graphical representation of ambient air pollution levels in several Pakistani cities reveals that the most densely populated cities, with available air pollution statistics, surpass the World Health Organization's recommended annual mean PM2.5 levels [13].

A key contributor to the air quality challenge in Peshawar is the improper combustion of solid waste, particularly medical and laboratory waste, which is disposed of through incineration in hospitals and laboratories. According to the World Health Organization (WHO), approximately 80-85% of waste generated by healthcare services is deemed non-hazardous, while the remaining 15-20% is classified as hazardous waste, second only to nuclear waste in

terms of potential harm to people and the environment. Incinerating medical waste exacerbates respiratory conditions, leading to lung diseases, severe allergies, tuberculosis, asthma, and other health complications [14]. Notably, a recent study disclosed that teaching hospitals, including Khyber Teaching Hospital (KTH), still use chambers instead of incinerators for waste disposal, indicating a deviation from standard operating procedures in hospital waste management [15].

The disposal of waste alongside roads poses a significant risk to nearby populations [16]. Hospital waste has various classifications, with pathological waste comprising human body parts, tissues, IV tubing, syringes, scalpels, and other non-decomposable materials. This study specifically focuses on non-biodegradable waste, including needles, drips, IV tubing, syringes, and similar items. With a population of 1.97 million based on the 2017 census, Peshawar attracts individuals from across the province for advanced medical treatment, emphasizing the extensive use of healthcare facilities [17]. Despite having numerous hospitals and laboratories, both public and private, these establishments often fail to adhere to the standard operating procedures mandated by the Pakistani government for waste disposal.

Any violation of environmental laws, rules, and regulations, such as releasing air or noise pollution, improper waste handling, or dealing with hazardous substances, is subject to punishment and fines according to the Khyber Pakhtunkhwa Environmental Protection Act of 2014. From an ecological perspective, it is crucial to manage and dispose of pollutants in the atmosphere, hydrosphere, and lithosphere that threaten the environment and public well-being. The study primarily addresses the issue of incinerating solid medical waste in Khyber Pakhtunkhwa's capital city. The analysis reveals that hospital waste disposal practices, whether through established protocols or outdoor incineration, disrupt the surrounding ecosystem [18].

The study aims to evaluate the management of medical inorganic hospital waste in various laboratories and hospitals, gaining insights into the professional perspective on the matter. It seeks to identify reasons for the failure to comply with government regulations and SOPs and aims to enhance the knowledge of medical waste staff regarding environmental issues. The ultimate goal is to address the issue not only for the benefit of the present population and environment but also for future generations [19][20].

Literature Review:

Hospitals generate solid clinical waste as a byproduct of providing patient care, with approximately 90% of the waste being capable of decomposing without posing risks to human health. However, the remaining 10% is hazardous and poses threats to both the environment and human health, carrying the potential for diseases such as hepatitis A, B, and C. Establishing a medical waste committee and developing an effective medical waste control plan are crucial steps [21]. A sustained waste management strategy, involving permanent disposal and restricted duration retention, can significantly reduce the quantity of hazardous waste. However, it is essential to consider all safety precautions and involve hospital personnel in efforts to appropriately dispose of garbage and safeguard the environment.

This article critically assesses the management of biomedical waste in the Accra metropolitan area of Ghana, revealing an unstable scenario through qualitative data-gathering methods. The lack of proper infrastructure for incineration and sanitary landfills poses a potential hazard to human health and the environment. Uncontrolled combustion and negligent disposal of infectious and poisonous waste contribute to the issue. Improper incineration of hazardous biomedical waste leads to the generation of cancer-causing substances. The study emphasizes the need for efficient and enforceable biomedical waste policies at the local level in every healthcare facility [22].

Challenges associated with hospital waste management have significant impacts on the surrounding environment, necessitating analysis of existing policies and legal obligations. Many states, especially industrialized ones, face challenges related to environmental pollution, including pathological waste from densely populated areas and rapid hospital expansion.

Investigations in India reveal inadequate handling of medicinal waste by medical shops and hospital dispensaries. The study explores various waste management methods but highlights the failure of hospitals to implement proper protocols, leading to pollution [23].

In undeveloped nations like Cameroon, inadequate methods of managing clinical waste pose significant risks to the environment and human health. A study employing the Health Impact Assessment methodology in Cameroon found that residents near waste disposal sites experienced health issues. Insufficient awareness among the workforce about the hazardous consequences of waste and environmental impacts was also evident [24].

The study evaluates the knowledge and awareness of team members engaged in waste handling across different countries. Dangerous methods for managing clinical and medical waste are recorded in the literature, accompanied by insufficient knowledge among individuals involved. The impact of hospital waste on the environment and public health is substantial, necessitating educational initiatives and awareness campaigns, particularly in developing nations [25].

Evaluating waste management methods is crucial for assessing the healthcare sector's impact on the environment. An assessment method considering upstream, downstream, and direct impacts was developed, highlighting the healthcare industry's indirect influence. The study suggests viable solutions for environmental management, including emission reduction and pollution prevention. Improper disposal of hazardous wastes by clinics and hospitals is addressed, providing recommendations for the establishment of secure waste disposal systems in Bangladesh. Seminars, enhanced understanding, and the implementation of rules and regulations are identified as essential components for effective waste management [26].

Methodology:

Study Design:

A descriptive cross-sectional study was conducted in three small private hospitals in Khyber Pakhtunkhwa (KPK) with a bed capacity of 22-35. The study period extended from March 2022 to June 2022.

Sample Size Calculation:

The total sample size was calculated based on a 70% power, an alpha error of 0.05, and a difference of 0.2 to 0.5. The calculated sample size was 117, rounded up to 120 for convenience.

Sampling Procedure:

The study utilized a purposive sampling method to collect data on waste treatment management systems in public and private hospitals and laboratories in Peshawar. Hospitals and laboratories were classified based on ownership into public, private, or semi-public categories. Teaching hospitals, which handle a substantial patient load and generate significant solid waste, were specifically targeted due to their importance in the healthcare landscape [27].

Categorization of Hospitals:

Both public and private hospitals were classified into two distinct groups to ensure a balanced and unbiased analysis. This categorization aimed to capture potential subjectivity in the responses obtained during interviews [28]. The distinction between hospitals offering low-cost services with potential quality concerns and those asserting superiority with higher fees due to exceptional cleanliness and maintenance will be explored in the study, highlighting discrepancies in waste treatment methods.

Data Collection:

Data and information were gathered through field surveys and open-ended questionnaires conducted via interviews. Interviews were specifically conducted with the focal person or committee in charge and the hospital waste management team actively involved in the waste management system. The focus of these interviews was to gain expert insights into waste management practices [29][30].

Ethical Considerations:

Ethical approval was obtained from the ethical review committee of the institute authorities before the commencement of the study. Participants' confidentiality was maintained by assigning a unique code to each person [31].

Data Analysis:

The collected data were entered into Microsoft Excel 2007 edition and analyzed. Descriptive statistics were used to present the findings in the form of graphs, tables, and text. The analysis aimed to provide insights into the participants' knowledge and awareness levels related to medical waste management practices in the selected hospitals [32][33].

Scope of Study:

The study primarily focuses on teaching hospitals, given their significant role in patient care and solid waste generation. The aim is to assess the adequacy of waste treatment management systems in these healthcare institutions and highlight any disparities in waste treatment methods between public and private sectors [34].

Results:

The research was carried out in private hospitals in Khyber Pakhtunkhwa, specifically in Peshawar, Pakistan. Approximately 120 questionnaires were distributed among healthcare workers, and responses were received from 69% of the participants. The study population comprised 92 individuals, with 40 (43.4%) females and 52 (56.6%) males. Among them, 25 (27.17%) were doctors, 47 (51%) were nurses, and 20 (21.7%) were lab technicians.

Table 1: Demographics of Study Population

Category	Count	Percentage
Total Participants	120	-
Responses Received	82	69%
Gender		
Female	40	43.4%
Male	52	56.6%
Occupation		
Doctors	25	27.17%
Nurses	47	51%
Lab Technicians	20	21.7%

Out of the 120 participants, 82 (69%) knew medical waste, with doctors having the highest awareness at 89%, followed by nurses at 71%, and lab technicians at 41%. In terms of knowledge of practice regarding the disinfection of medical waste, doctors had the highest score (84%), followed by nurses (79%), while lab technicians scored the lowest (45%).

The perceived need for a separate permit for medical waste was acknowledged by 90% of doctors, 52% of nurses, and only 49% of lab technicians. In terms of awareness about medical waste storage and management, color coding, placement of sharp materials, and protective measures, nurses showed the highest level (91%), followed by doctors (83%), and lab technicians had the lowest awareness (69%).

Table 2: Knowledge and Practice of Medical Waste Management

Category	Doctors	Nurses	Lab Technicians
Knowledge about Medical Waste (%)	89	71	41
Knowledge of Practice - Disinfection (%)	84	79	45
Awareness of Permit for Medical Waste (%)	90	52	49
Awareness of Storage, Color Coding, Placement (%)	83	91	69
Attitudes - Personal Protection (%)	95	92	67
Importance of Waste Management as a Team (%)	98	86	-
Importance of Safe Disposal of Waste (%)	91	86	59
Practical Knowledge (%)	94	90.5	45.8

Practice of Color Coding (%)	98	69	39.7
Practice of Recapping (%)	93	78	41

When it came to attitudes regarding personal protection by using gloves, disposal of needles, and color coding of disposable nags, doctors demonstrated a high awareness of the importance of HCW management (95%), followed by nurses (92%), and lab technicians with a response rate of 67%. All doctors (98%) considered waste management as a team effort, while the percentage for nurses and lab technicians was 86%. However, 25% of nurses believed it was the job of persons assigned for this act.

In terms of safe disposal of medical waste, 91% of doctors, 86% of nurses, and 59% of lab technicians emphasized its importance. Doctors had the highest percentage (94%) of practical knowledge. Nurses demonstrated more awareness and practice of color coding (98%) and recapping (93%) compared to doctors.

Regarding hepatitis B vaccination, 93% of doctors, 47% of nurses, and 14% of lab technicians reported being vaccinated. In terms of reporting injuries related to HCW management, 96% of doctors, 82% of nurses, and 56% of lab technicians considered it important.

Table 3: Hepatitis B Vaccination and Reporting Injuries

Category	Doctors	Nurses	Lab Technicians
Hepatitis B Vaccination (%)	93	47	14
Importance of Reporting Injuries (%)	96	82	56

The usage of personal protective equipment was consistent among doctors (96%) and nurses (93%), while lab technicians had a lower percentage (54%). Overall, doctors demonstrated higher knowledge and attitude scores, whereas nurses scored higher in practicing medical waste management. Doctors emphasized the importance of hospital waste management more than nurses and lab technicians. The data presented in the table indicates that 98.1% of doctors were aware of HC Waste Management, while 73% of lab technicians were not aware.

Discussion:

The study investigates the intricate landscape of healthcare waste management in private hospitals of Khyber Pakhtunkhwa, particularly in Peshawar, Pakistan. It offers a comprehensive exploration of the knowledge, attitudes, and practices exhibited by healthcare professionals, including doctors, nurses, and lab technicians, concerning the proper disposal of medical waste. The discourse delves into the broader global context of healthcare waste, emphasizing the critical need for effective management to curb the spread of diseases and control infections. The study pinpoints challenges in waste management, drawing attention to the disparities between developed and developing nations in enforcing regulations and addressing issues such as inadequate knowledge and funding.

The discussion extends to the environmental and social impacts in Pakistan, highlighting the escalating challenges in densely populated urban areas like Peshawar, where improper medical waste combustion contributes to severe air pollution and associated health complications. Through a meticulous examination of the knowledge and practices of healthcare workers, the study sheds light on varying awareness levels among different professional groups, ultimately calling for targeted interventions to bridge gaps and improve waste management practices. The methodology and results analysis provide a robust foundation for future research and policy initiatives, setting the stage for enhanced healthcare waste management in the region to benefit the current population and safeguard the well-being of future generations.

Doctors and nurses demonstrated a higher level of awareness in waste management compared to paramedics and sanitary workers, mirroring findings from a study by Holla et al. In the present investigation, doctors and nurses exhibited a better understanding of waste segregation processes and responsibilities compared to paramedical staff and sanitary workers,

aligning with similar research. The majority of respondents displayed awareness and responsiveness regarding the color coding of bags, consistent with findings from another study.

In terms of knowledge and practice, a significant number of doctors and nurses exhibited a superior understanding of placing sharps in highly dense containers compared to paramedics and lower-ranking staff, similar to results from another study. While all respondents were aware of the existence of hospital waste management committees, there were no specific job descriptions. This contrasts with a study indicating the absence of policies and committees in a dental hospital. Regarding waste disposal practices, the majority of respondents in the current study lacked proper practices, and public hospitals lacked waste disposal facilities, a finding consistent with another study. Proper and secure management of hospital waste is crucial for maintaining a safe environment and promoting health. Regular supervision and training are imperative at all levels.

Conclusion:

In conclusion, the study contributes significantly to the understanding of healthcare waste management in private hospitals in Khyber Pakhtunkhwa, Pakistan. The findings underscore the importance of targeted interventions to enhance awareness, knowledge, and practices among healthcare workers. The environmental and public health implications of improper waste disposal necessitate urgent attention and comprehensive strategies. The study sets the stage for future research and policy initiatives aimed at improving healthcare waste management in the region, with potential benefits for both the current population and future generations.

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