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TO STUDY THE MEDICAL WASTE MANAGEMENT IN DISTRICT HYDERABAD: A SOCIOLOGICAL INVESTIGATION

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Abstract
The primary source of medical waste comprises hospitals, diagnostic centers, and clinics, where medical treatments are administered, thus contributing to the generation of hazardous waste that poses significant risks to public health, particularly affecting individuals with severe diseases. The foremost imperative is to comprehend medical waste management, followed by the necessity for the acquisition of control measures and techniques through formal education. The principal objective of this study is to assess the perceptions of the populace concerning hospital waste management practices within the designated study area and to catalog the medical waste produced by local hospitals and clinics. This investigation evaluates the legislative frameworks and regulatory actions undertaken by authoritative bodies concerning public health facilities. The data indicate that medical waste is predominantly generated in private hospitals at a rate of 71.25 percent, in government hospitals at 25 percent, and in semi-government/NGO hospitals at 3.8 percent within the study area, suggesting that government hospitals present a greater hazard to public safety. The initial step involves enhancing the capacity of trainers, who should be actively involved in promoting awareness as part of an ongoing learning process for both public and private health facilities, alongside the development of strategies aimed at reducing medical waste in hospitals and clinics for the long term.
Keywords: Medical waste management, healthcare, hospitals, diseases, Pakistan

1. Introduction

Health care waste management is top most important factor for treatment and disposal waste because infection microorganism in healthcare waste can be affected staff and peoples. Due to improper waste management practice 3,800 HIV infections, while hepatitis B “HBV” 1.9 million infections, hepatitis C “HCV” 315,000 infections observed (WHO, 2022). Those persons who involves in hospitals cleaning and scavengers identified on high risk, like 0.3 percent HIV, 30 percent HBV and 1.8 percent HCV [1]. Before pandemic five times higher medical waste spread [2]. Low developing countries they are not concerned about health specially they have rapid population and low income problems [3] medical waste not only hazards for peoples directly but effected eco-friendly products, like underground water polluted, many species effected directly and indirectly and face economics issues [3]. There is no proper training done for staff regarding medical carry and handling in developing

nations [4]. Many developed nation across the world medical waste burned and generate energy up to 90 percent [5]. While environmental openly burning is highly risk for carbon emission and residuals [8]. The segregation of medical waste must be recycling and reuse made possible given serious consideration [6]. Continues higher rate of pharmaceutical change the human behavior for waste in environment [7].

Medical waste not only effect human life but environmental hazards create for people's life, and effect entire country economy for sustainable development opportunities [9]. Medical waste recycling and reuse for revenue steam [10]. Moreover, poisonous medication wastes can affect the human, insect, plant and other organism life cycle [11]. Developed countries around 0.5 kg "bed day^{-1}" hazardous waste generate and developing countries 0.2 kg "bed-day^{-1}" generate waste [12]. Medical waste hazards contain toxic, radioactive, poisons, infections and other causes create environmental and occupational health risks [13]. Medical waste includes surgical instruments, pharmaceuticals, syringes, bandages materials possess risk for public health environmental and ecosystem [14]. In developing regions mismanagement of medical waste seen like, autoclaving, burning, dump in water, and other may need stick rules and public awareness [15]. In Pakistan almost 250,000 tons of medical waste of hospitals creates. Hospital management poorly tacked employees has assigned duties regarding medical waste [16].

1.1 Problem Statement:

A problematic aspect of medical waste and unwanted disposal systems, which leads to serious environmental and public health concerns. Inadequate management, particularly in low-resource areas, results in improper disposal methods like open burning, illegal dumping, or mixing hazardous waste with regular garbage. This can expose waste handlers and healthcare staff and the public to infectious diseases, poisonous substances, and environmental pollution. Additionally, the failure to enforce strict regulations and provide sufficient infrastructure for safe medical waste disposal aggravates the situation, making it a persistent and dangerous issue worldwide. The medical waste observed in private hospitals 71.25 percent, in government hospitals it is 25 percent, while semi-government/ NGOs/ INGOs hospitals 3.8 percent found. Most of the private hospital followed rules and techniques adopted as compare to government hospitals [17].

1.2 Objectives of the study:

i. To determine the people's perceptions regarding hospital waste management practices in study area.
ii. To find out/categorize medical waste, produced by local hospitals/clinics.

1.3 Significance of the study:

The significance of study waste and unwanted medical waste lies in its critical impact on public health, environmental sustainability, and healthcare management. Proper understanding and management of medical waste are essential to avoid infection diseases and protect healthcare staff and reduce environmental threads with rising healthcare demands and technological advancements, the volume of medical waste continues to grow, making efficient disposal and treatment methods on top priority. This study can inform policies for waste reduction, enhance safety protocols, and promote sustainable waste management practices, which are crucial for safeguarding communities and ecosystems. Furthermore, it can help identify gaps in regulatory frameworks and infrastructure, leading to better solutions for managing both hazardous and non-hazardous medical waste. This study aims to explore the social implications of medical waste management, in district Hyderabad, and focusing on the importance of education for future healthcare workers and engineers. It seeks to gather insights from stakeholders to present actionable recommendation for improving medical were management in district Hyderabad.

1.4 Limitations of the study:

The limitations of studying waste and unwanted medical waste primarily stem from the complexity and variability of waste management systems across different regions. One major limitation is the lack of consistent data on medical waste generation, particularly in low-income countries where reporting and monitoring are often inadequate. Additionally, variations in waste classification, disposal practices, and regulatory frameworks make it difficult to generalize findings across different healthcare settings. Another challenge is the limited access to advanced waste treatment technologies in developing areas, which may skew the results toward regions with better infrastructure. The study may also face limitations in assessing the long-term environmental and health impacts of improper disposal, as these effects may take years to manifest. Moreover, cultural and institutional barriers may hinder the implementation of recommended practices, limiting the practical application of the research findings.

2. Research Methodology

2.1 Research Design:

Experimental research is in line with the research methodology, which will be managed to identify something new in the available realities of the learning environment. The study will be compiled using a qualitative and qualitative approach to achieving the objectives of the study. Intentionally, the information will be collected from key sources or directly communicated and responded in a conversational manner. However, information will be collected by involving local community members and hospital staff using a random sampling method and a sampling method for in-depth information.

2.2 Study area:

Tandojam, located in the Hyderabad region of Sindh, province, will be focus community of this research, due to sufficient availability and trouble-free accessibility of certain hospitals and clinics. Tandojam is 20 km away from Hyderabad city situated at 25.42718 latitude and 68.53619 longitude, and bordered with district Matiari, Tando-Allahyar and Tando Muhammad Khan. Hyderabad district consists of huge population and the second highest population city, of Sindh province and contains large area, therefore the researcher will be confined to a town and union council of Hyderabad to fulfill the research ethics that may be acceptable to the scholastic community.

2.3 Population and sample size:

It is hard to find the exact number of total targeted population, as the statistical department is severely lacking the targeted database in Pakistan. The total population of Tandojam is approximately 31613. The targeted population for the study is Tandojam with its surrounded village's (Musa Khatiyan, Lashari Goth, Kaleri Goth, Makrani Goth, Tando Qaisar and Kisana Mori). In total, the sample size for this study was settled to access 200 respondents/patients, for quantitative data by conducting a survey and 5 hospital employees were purposively selected for in-depth interviews (qualitative data), where two doctors and three other staff or sanitary workers were interviewed to take in-depth information on the issue.

2.4 Sampling method:

The Simple Random Sampling method was adopted to meet the study objectives involving common people/ patients and the hospital employees. For the purpose, mainly government hospital was targeted which is frequently visited by mainly rural people. The designated sampling method (Simple Random) is easy and bother less, though some of the researchers also mentioned this proposed study as 'Convenient Sampling Method', as it is convenient for researcher to stay in one place while targeting to the respondents. However, for getting qualitative information, 5 respondents/employees were purposively selected (purposive sampling method) for in-depth interviews.

2.5 Instrumentation and measurement

Methods of data collection depends upon a questionnaire (reliable and validated) as a survey for compilation of data, therefore, the researcher tried her best to adopt already validated questionnaire. In response, some related questionnaires were found yet those were carefully reviewed and altered according to local situation to make it reliable. Finally, supervisory committee found it satisfactory, however advised to confirm reliability and validity through authentic means/analysis.

2.6 Reliability and Validity:

It is about helping to reduce operational issues, referring to youth where steel can be built. As such, it can be understood by both participants and the researcher that they gain points. In this regard, honesty and legitimacy are important although the most effective methods must be effective and reliable [17]. Reliability can be a reflection of the similarities found in driver research prior to data collection and is often measured by Cronbach's alpha, which should not be less than 70 [17]. Therefore, this method (Cronbach's alpha) was used to verify the reliability of the instruments by incorporating the first 30 questions [18] into SPPS, and the total scale as described in Table:1 was found to be satisfactory highlighting pre-test with .760 and final test .806.

Table-1: Reliability of the constructs

Appendix-1	**Concept/variable**	**No. of Items**	**Cronbach's Alpha**	
			Pre-test (n=30)	**Final test (n=200)**
Reliability	**Perception**	18	.760	.806

3. Results

Table-2: Age of the respondents

	Minimum	Maximum	Mode	Mean	Std. Deviation
Age	25.00	60.00	40	41.59	11.326

Age is a main variable that indicates about the defendants 'adulthood stage. The results in table-2, disclose that the average age of the defendants were 41.6 years however respondents having the age near 40 were initiate commonly in the study zone supercilious that the answers could be consistent to excerpt the fallouts and assumption. Though, least age of the defendant was documented of 25 years, and the extreme age of defendant was noted60 years.

Table-3: Education of the respondents

S. No#	**Educational status**	**Std. Deviation = 1.189** **Std. Error = 0.78** **Frequency**	**Percentage**
01	Nil	146	73.0
02	Primary	10	5.0
03	Matric	22	11.0
04	Inter	12	6.0
05	Graduate and above	10	5.0
	Total	200	100.0

Education is main socio-economic variable that may impact absolutely the performance of the defendant, if an individual is very educated. In this portion, the defendants 'qualification was characterized into 5 clusters (Illiterate, Primary, Matriculation, Intermediate and Graduation and above) conferring to their enlightening stages. The outcomes of the investigation display in the Table-3 that the first common, tiny less than three fourth majority (73.0 percentage) of the defendants were illiterate, which designates that the important mainstream amongst the defendants may have thin

hallucination. Shadowed by, 2nd uppermost mainstream was considered to be the well-educated having (11.0percentage) in the research learning part, though, the lowermost majority of the defendants having (5.0percentage) with respects to their edification were initiate to gaining prime and alumnus level educations, that exposed the slight twist of the edification in the area of study.

Table-4: Occupation of the respondent

S.No#	Professional status	Std. Deviation = .822 Std. Error = .058 Frequency	Percentage
01	Agriculture (Direct)	14	7.0
02	Agriculture (Indirect	58	29.0
03	Non agriculture	94	47.0
04	House work only	34	17.0
05	Total	200	100.0

The profession of the defendants in an area of study guide about chances obtainable to get money for their children. The professional grouping of the defendants is obtainable in Table-4. Which displays that nearly partial of the majority (47percentage) of the defendants were involved with in on-agricultural occupations, however the area of study proposes excessive chance in agricultural/subdivisions but agricultural occupation could be non-reliable in the study area, consequently the majority of the defendants' favored non-agriculture subdivision to earn cash and grease. Shadowed by, the 2nd uppermost majority, greater than one fourth (29.0percentage) of the defendants were linked with the agriculture living but circuitously. Furthermore, the smallest majority (7.0percentage) of the accused were imaginary to be complicated in the agriculture events. The general fallouts of the study propose that the important majority of the defendants do not desire agriculture as occupation may be due to its hazarded finance.

Table-5: Respondent total family Income

	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Error	Std. Deviation Statistic
Approximately total income from all sources	200	6000	60000	22160.00	807.485	11419.564
Valid N (listwise)	200					

The income of a household translates into existing values of the defendants. Basically, additional income displays extra gratification or appreciating the lifetime. Meanwhile, preceding table (professional category) shows that the majority of the defendants were involved with moreover non-agricultural income vents or unintended agricultural occupation, and their prerequisite was also pretty little or zero consequently one can effortlessly supposing the lowermost level of proceeds. Though leading survey, few of the defendants were also disinclined to share their unique monthly income, when they completely pleased about the in-section drive (educational or research) they replied, therefore. The consequences shown in above Table-5. that there was fairly an enormous disparity (SD=11419.564) in their once-a-month income, where few of the defendants were receiving only Rs.6 thousand/month, and a scarce were getting Rs.6 thousand once a month. Though, the usual income of the defendants were Rs.22160/- per month, representing little income level consequently in pending to an administration hospital (inexpensive choice for well-being facility) slightly to avail private costly well-being services.

Table-6: Family structure of the respondents

		Frequency	Percent	Std: error	Std: deviation
Valid	Single	148	73.5		
	Joined	52	26.5	.031	.440
	Total	200	100.0		

Family structure is a variable indicator, which shows about the societal building in an area or public. Table-6 shows that the noteworthy majority, minor less than three fourth (73.5percent) of the defendants were familiar in sole/nuclear household structure. Nuclear household denotes to husband, wife and their offspring those were existing below one roof. This situation indicates that unlike to follow rural customs the majority of the local people prefer to live under nuclear system due to multiple reasons. Though, only about one fourth majority (26.5percent) of the respondents are originated with the combined family structure. Hence, the consequences demonstrate that the majority of the persons in the study area are prejudiced by city nation or might be troubled due to inspiring tendency of price rises.

Table-7: Interviewed conducted

Respondents	**Numbers**	**Percent**
Doctors	20	10
Medical staff	20	10
Sanitary workers	20	10
Patients	60	30
Local peoples	40	20
Residents	40	20
overall	200	100

The data were collected through random sampling technique and 10 percent doctors, 10 percent medical staff, 10 percent sanitary workers were selected from hospitals, while patients 30 percent, local peoples 20 percent and residents nearby hospitals 20 percent were interviewed as shown in table-7.

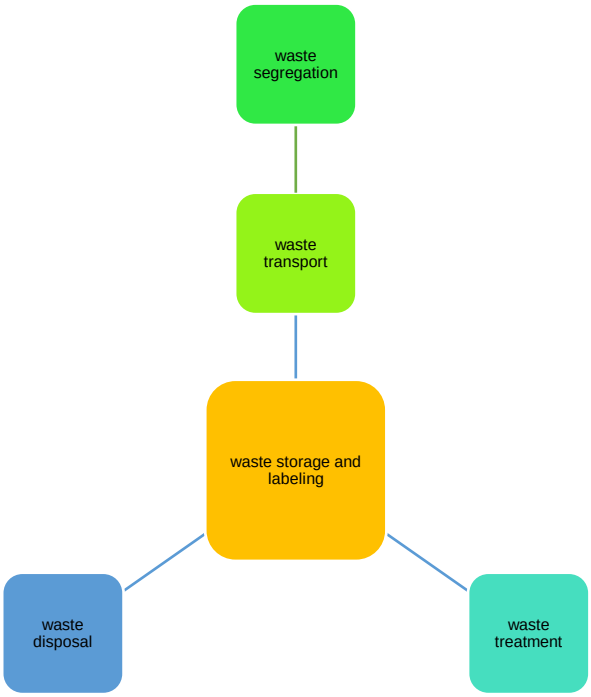

Figure -1: Stages of Clinical Waste Management.

There is most important thing, decided which medicine need to waste, when decided is final then transport from stock, then furthermore categories waste should be disposal or waste treatment as shown in figure-1.

Table-8: Current scenario medical waste management in Hyderabad

Clarifications	1st Majority (%)	2nd Majority (%)	Mode	Mean	S. Deviation
Syringes and other waste medicine are properly disposed of in dustbins and cannot be recycled.	94.5 (Strongly Agree)	5.5 Agree	Strongly Agree	2.95	.345
Are you satisfied with medical waste management practices/in the hospital	68 (Agree)	23 Strongly Agree	Agree	2.05	.464
Walls are clean	46 (Strongly Agree)	33 Agree	Strongly Agree	1.65	.943
Sweeper/sanitary workers are performing their duties properly	39 (Agree)	38 Strongly Agree	Agree	1.59	.751
Dumping site of hospital covered and safe	37 (Strongly Agree)	28 Agree	(Strongly Agree)	1.44	1.850
Sanitary workers are clean and follow SOPs (mask and sanitizer)	36 (Agree)	32 Strongly Agree	Agree	1.37	.954
The entrance of the hospital is clean and well-managed	37(Agree)	33 Strongly Agree	Agree	1.33	.845
People/staff/workers are habitual to use dustbins.	41 (Agree)	22 Strongly Agree	Agree	1.15	1.846
There is a proper mechanism for lifting bio-waste from the dumping site	47 (Partially Agree)	25 Agree	Partially Agree	1.01	1.261

Waste containers are properly used	44 (Agree)	12 Strongly Agree	Agree	.88	1.649
Transportation to the dumping site in the proper way (Trolley/cart)	47 (Agree)	14 Partially Disagree	Agree	.86	1.852
The area of the hospital is clean to a certain extent	24 (Strongly Agree)	19 Partially disagree	Strongly Agree	.84	1.849
Dustbins are clean and properly managed	29 (Agree)	20 (Strongly agree)	Agree	.55	1.44
The toilets are clean and ready to use	18 (Neutral)	17 Partially Agree	Neutral	.55	1.853
Phenyl is used to disinfect the hospital area	24 (Partially Disagree)	23 Partially Agree	Partially Disagree	.41	.653
Dustbins are placed at suitable places and distances to reach	44 (Strongly Agree)	37 Agree	Strongly Agree	.25	.556
Transportation to the final site regularly and safe	45 (Partially Disagree)	21 (Partially Agree	Partially Disagree	.04	1.367
There are no drainage issues with the hospital premises	34 (Neutral)	12 Agree	Neutral	.02	1.848

(3=strongly agree, 2=Agree, 1=slightly agree, 0=Neutral, 1=slightly disagree, 2=Disagree, -3= strongly disagree)

The researcher witnessed the different scenes and scenarios while visiting the hospital and pieces of evidence were also provided in the shape of pictures. However, the researcher was not fully allowed to take pictures of the hospital except few places, which made a huge limitation of the study. The observation of the study area divulged in table-8, that the garbage/waste management system in the hospital was not satisfactory though the significant majority of the respondents were highly satisfied with the waste management process in the hospital. This contradiction between survey results and observation made by the researcher may be due to educational level. In addition, the local patients may not pay much attention to waste management things or they do not have any examples to compare the things or the previous administration maybe even worst practices. Beside the entrance gate of the hospital, a huge amount of harmful waste could be seen in the lawn which was not even covered, ground was not cleaned properly, disposable syringes were increasing the dirtiness of the hospital, the floor of the hospital was showing that sweeping had never done there, walls outside as well as inside had uncountable spots of spits and different kinds of marks like gutka /supari/ pain, opened electric wires and broken bulbs were hanging from the ceiling, every corner was filled with uncovered broken and dirty dustbins holding lots of outflowing wastage including plastic bottles, bloody cotton, bandages, tablet wrappers, syringes, drips, glass wares, edible materials etc.

Table-9: Medical waste, produced by hospitals/clinics.

Organic Bio-waste	**Inorganic Bio-waste**
Medicine (Mostly expired)	Tablet wrapper
Bandages	Medicines bottle cover
Cotton	Plastic and plastic bags
Disposable plates and glasses	Broken glass
Office paper	Disposal syringes
Food items	Glass
Water	strips
Handkerchief/Cloth’s pieces	Needles
Masks	Tape
	Drips
	Blades
	Vial/Ampoule

Plastic gloves
Linen

The researcher divided the bio-waste into two following sub-categories based on their nature as shown in table-9:

3.1 Organic Bio-waste

Organic Bio-waste is a major hazard associated with its dumping in landfills. Due to the lack of oxygen, living debris continues the anaerobic decomposition process when buried in a landfill. This produces methane, which is then released into our atmosphere. These include Bandages, Cotton, disposable plates and mirrors, Office paper, food items, Water, Masks, and handkerchiefs / Fabric.

3.2 Inorganic Bio-waste

Inorganic waste is difficult to decompose, and the accumulation of natural debris can prevent soil compaction by invading plant roots. In addition, the unusual waste that covers the forest soil will keep water in the soil, thus preventing the absorption of nutrients that fertilize the soil. These include Tablet Wrap, Drug Covers, plastic and plastic bags, broken glass, disposable syringes, glass, strips, needles, tape, and drips, Blades, Vials / Ampoules, Plastic Gloves, and Plastic.

4. Discussion

There are many methods to prevent/ minimize hazards regarding medical waste but two main below discussed. The segregation of medical waste to protect the contamination for hazards and non-hazards. Find out the toxicity and volume of waste steam, the segregation way easy for transport and recycle and reuse. Bio-waste management practices were positively viewed by the respondents therefore the mean value of any question was not perceived negatively, which shows overall satisfactory progress related to bio-waste management in the hospital but at the bottom level. During the survey, the researcher was not fully allowed to take pictures of the hospital except few places, which made a huge restriction on education. The observation of the study divulged that the garbage/waste management system in the hospital was not satisfactory though the significant bulk of the defendants were highly satisfied with the waste management process in the hospital. It had been also visited by the local hospital after a long period by the investigator. Though the existing waste management system of the hospital is not fully encouraging this visit also somehow surprised the researcher [20]. Comparative analysis through observation narrates that the recent public-private joint venture in the local healthcare system showed somehow better progress in comparison to the previous (only governmental administration) one. The testing laboratory was partially managed/cleaned comparatively, the syringes/glass wares or cotton which were present there were uncovered, uncovered and dirty dustbins were present there under the stretcher, one bin was filled with blood test material including blood spots which were outflowing from that and other one was filled with other waste which was too outflowing and uncovered. Healthcare waste includes waste generated by health facilities, medical laboratories, and biomedical research institutes. Improper treatment of this waste poses a serious risk of transmitting the disease to garbage collectors, waste workers, health workers, patients, and the general public through exposure to infectious agents. Waste management removes harmful and bad pollution from the community [21]. However, contaminants of highly contagious chemicals such as the COVID-19 virus have created significant instability in the management of health waste and subsequent recycling due to the volume of waste generated and its nature of infection [22]. Methods and knowledge of medical personnel for environmental waste management. It has been confirmed that hospital waste is still being managed due to the lack of a program or MPSD system in all study units, which proves the non-implementation of applicable regulations and the incomplete internal management system in many laboratories. Due to the unavailability of health professionals and the lack of quality and quantity of resources, workers are not well-versed in regulations [23,24].

5. Conclusion and recommendation

Medical waste are highly hazards for people's health, especially those who involved in cleaning and transport waste. Lake of waste acts implementation create high risk and fatal diseases. Many

government hospital are not taking serious problem of medical waste. Private hospital are taking measures but need more step and strong action needed for peoples safety In Pakistan many gaps identified regarding medical waste management techniques, implementation, policy making. The first priority is that training arranged for staff and capacity building steams should be arranged for safety purpose. While segregation of medical waste is important for safety. Environmental protection measures should be adopted for safety purpose, like burning of medical waste and sea/ rivers medical waste dump. Medical waste burns create pollutions and other fatal diseases Capacity building of trainers and trainers should be engaged in awareness on continues learning process for public and private health facilities and make strategy for minimize medical waste in hospitals/ clinics for long term.

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