



# Comparative Assessment of Awareness, Knowledge, Attitude and Practices of Health Care Waste Management among Paramedical Staff: Findings from Lahore, Pakistan.

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**Abstract:** Background: Healthcare (Biomedical) waste can be defined that all waste generate from healthcare settings, considered infectious and hazardous. It requires specific handling prior to its disposal and poses a stern dangers to ecological, occupational and public health if not managed with caution. Hazardous waste management is the major responsibility for every health care facility as well as every healthcare professional. As Lady Health Workers, Lady Health Visitors, TBAs, Sanitary Workers and Nursing Interns are the primary members healthcare team and during provision of care to the patients they are the primary people dealing with the healthcare waste due to the direct contact with the patient. Methodology: The present study is cross-sectional & quantitative in nature. Data was collected by a self-administrated modified questionnaire from 240 healthcare professionals (paramedics) at the different levels of health care providers like Public, Private, DHQ and THQ Hospitals, RHC and BHU of Lahore. The questions related to KAP included 37 items. To assess the knowledge, 13 questions were organized with satisfactory/not satisfactory. For the assessment of the Attitudes total 14 items having favorable/unfavorable as responses and the last one was practical work assessed by the study population's replies & direct observation (10 questions) related to their personal protection measures and proper biomedical waste disposal practices having appropriate/inappropriate response. The collected data was put into SPSS Version 21 for obtaining more reliable results. Results: According to the findings Health Care Workers have not enough knowledge, nor did satisfactory attitude/practices. The study found the inconsistencies during waste management in hospitals are generally because of low amount of financial resources, poor awareness & trainings. **Conclusion:** Management of biomedical waste is neglected in Pakistan. There is a need to take concerted efforts towards this.

Keywords: Attitude, knowledge, waste management practices, Healthcare Workers, Bio-Medical Waste, Health Facilities

## 1. Introduction

Health care waste is produced by the health care establishments during their functioning (Ilyas, 2004). Medical centers have high criterion of safety and hygiene, as the workplace for medical treatment as well as betterment for health, though, healthcare staff is faced by countless professional risks because of different type of the nature of work. The hospital is a basic institution that is visited by all people who lived in a society without discrimination among race, gender, age, etc. The WHO has defined medical waste as under; "All the waste generated within healthcare facilities, research centers, and laboratories related to medical procedures; including the same types of waste generated from other scattered sources and homes". (FC., JS., & TG., 2018, 10). Biomedical waste management is significant to defend the environment and health of the population. Medical waste (MW) is an important and very serious issue for human health as well as an environment which draws heed world-wide i.e., developed as well as underdeveloped nations. Main types: Harmful or damaging waste and Non-harmful waste.

1. Harmful or damaging waste, the Harmful waste can be divided further into radioactive, pharmaceutical, sharps, infectious, cytotoxic, chemical, pathological, and chemical waste.
2. The non-harmful waste, normally account for the major chunk of total medical waste (75% - 90%) that is as like to household waste and includes waste produced from maintenance work, administration related works as well as repair work; whereas harmful leftover make up merely



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10 - 25%.

The proper guidelines are present from central to secondary as well as tertiary stages telling the relevant sectors for adequate disposal of HCW in the rich countries. The introduction of more modern instruments and advances in health centre have enhanced the waste generation per patient in medical units throughout the world. Rich nations produce on average up to 0.5 kg of harmful waste per HCF per patient daily, according to the WHO Poor nations generate merely 0.2 kg per hospital bed per day, though the figure is very low yet medical waste usually not segregated into harmful or non-harmful wastes, making the actual amount of harmful waste potentially much higher. Inadequate handling of HCF waste is an alarming health risk in the developing world. due to lack of awareness about proper segregation, burden of diseases increases day by day. Respondents having less than 50% knowledge and attitude, whereas practices less than 20%.

Management of Biomedical waste has appeared as an issue of basic concern for both hospitals and environment. This study assesses HCW methods at all level of medical facilities in Punjab district Lahore to identify the difficulties as well as to help in managing and proper disposal of waste generated by the hospitals, etc. Mostly HCFs of Pakistan, including Lahore, biomedical wastes are not deal separately whereas mixed with the municipal leftover in the containers. Advancement in medical services and the introduction of more sophisticated techniques have much more burden on the management of BMW & increased the waste generation rate per patient all over the world.

The importance of this study is based on the attention to the health and life in general, especially in underdeveloped countries because these countries are vulnerable to different types of waste produced by different activities in the HCFs and what the underdeveloped countries are already facing difficulties in dealing with this waste and how to manage it for various reasons related to resources, awareness and management. (Elsidig, JUNE 2010). The inadequate awareness regarding waste management of hospital rules 2005 especially paramedics, nurses, administration and waste handling staff in government hospitals is a major concern. Consequently, medical waste is a real threat to human life and it is one of the most harmful types of waste for the nature as well as the health of people. Stressing that the dearth of effective management for disposal of such wastes cause many diseases the most dangerous of, are Hepatitis B, C, Tuberculosis and AIDS. (Dawar, 2017). The inadequate handling of medical waste in the desert areas as well as valleys is a time bomb, which can be exploded in future. And experts have stressed that the MW in the underdeveloped world was not thoroughly studied in terms of classification, characteristics or volume. The paucity of precious information and reports on medical waste is a grave difficulty. (Elsidig, JUNE 2010). This research will contribute an important part to enhance the awareness, education of hospital staff and public in general regarding the handling of BMW from producing to the last step of the management.

If the relevant authorities successfully enforce the hospital waste management laws (HWM), it will reduce the threat to environment and public health in private as well as public sectors. This research also considers as a basic knowledge provider about actual situation in the HCFs.

## 2: Materials and Methods

The present research analyzed knowledge, attitudes and practices (KAP) of Health Care Workers (HCWs) about proper waste management at their working place. The objective of this effort is to analyze the awareness, attitudes & Para medical's work practically related to the management of BMW at Public, Private, DHQ and THQ Hospitals, RHC and BHU of Lahore, Punjab. Sample for this study was selected by mean of convenience sampling method.

The aimed to ascertain the gaps in implementation as per health care waste management rules 2014 at these hospitals. The methodology was cross-sectional and consisted on the data (survey based) and talk to the heads of the institutions, persons concerned with waste (handling and transportation). Health-care workers were the study population in this research who working in selected health care settings. These included Nursing Interns, LHVs, midwives/TBAs and sanitation staff.

A sample of HCWs is 240 respondents. The structure of the data collection, Mayo Hospital & Lady Atchison Hospital, Jinnah Hospital, PIC, Fatima Memorial Hospital, Ghurki Trust Teaching Hospital, Govt. Mian Munshi Hospital, Rana Abdul Raheem Hospital, RHC (Ghaziabad), BHU (Liddhar & Iel) and Private TBAs. A modified & very clear questionnaire was created for this study as tool filled by the all participant. There were no difficulties faced during the data collection phase. The tools designed in English language and also converted into the Urdu as well.

Purposive sampling techniques were used for selection the sample population in which the subjects are being analyzed and it depends on the researcher's judgmental methods. Paramedics

who fit for the present study were Nursing Interns, LHVs, midwives, TBAs and sanitary workers from Public, Private, DHQ and THQ Hospitals, RHC and BHU of Lahore, Punjab.

A total of 240 individuals randomly selected from Lahore. The individuals/participants identified according to the set criteria (inclusion criteria). The identification of the participants was omitted. They also had the right to give up this study when they want to withdraw. A modified & very clear questionnaire was created for this study as tool filled by the all participant. There were some difficulties faced during the data collection phase due to time constraints of hospital staff. The collected data was put into SPSS Version 21 for obtaining more reliable results. On SPSS sheet where the collected data was categorized, ordered, manipulated and summarizes. Codes assigned to the different variables for the obtaining results on SPSS. Then the findings were showed in the tables form with Frequencies & percentages. To compare the association of knowledge, attitude & practices, Chi – square test was applied.

**3. Results**

The following types of participants are included in the current research, i.e. LHVs, LHWs, Nursing Interns, Sanitary workers and Midwives/TBAs. More than 90% participants are not aware about safe waste management and importance of proper hospital waste management.

The research is conducted from Public, Private, DHQ and THQ Hospitals, RHC and BHU of Lahore, Punjab. Total sample size is 240. Basically this research is about Knowledge, Attitude and Practices regarding health care waste management at every level of health facility. Their Knowledge is poor because very low percentage having awareness about HCWM.

Only 22% Nursing Interns were able to define HCWM. 35% S.Ws, 16% LHWs20% LHVs, and 35% Midwives/ TBAs knew about Health Care Waste Management.

Whereas 29% S.Ws are agree to adopt right ways regarding HCWM. 50% Nursing Interns are agreed. LHVs are agreed for safe methods about WM and in the satisfactory number that is 90%. The participants observed during their working and completed the questionnaire. Only 11% Nursing Interns are practiced the proper WM, 7% S.Ws. and zero practice observed in LHVs, LHWs and Midwives/TBAs. But one positive thing is that 79% participants are willing to attend a training regarding WM and eager to learn about proper WM. Therefore 21% participants were not interested to attend any training / session. They were rigid at old and unsafe practice. There are points regarding Knowledge, Attitude and Practices;

**Figure 1: Hierarchy of waste management Source: (Elsidig, JUNE 2010)**

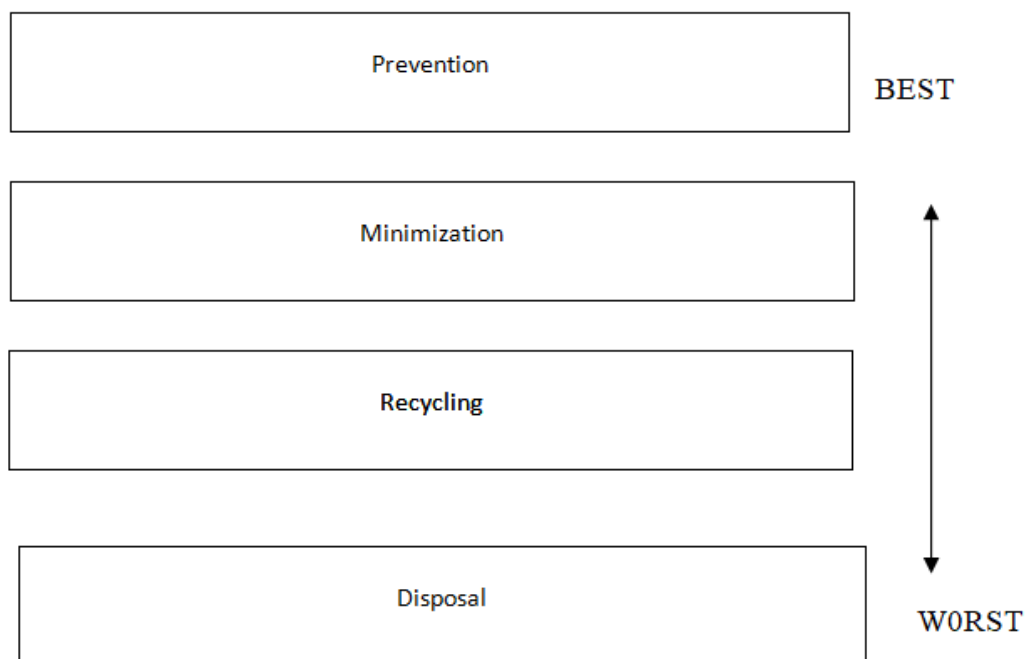


Figure 2: Geographical place of study

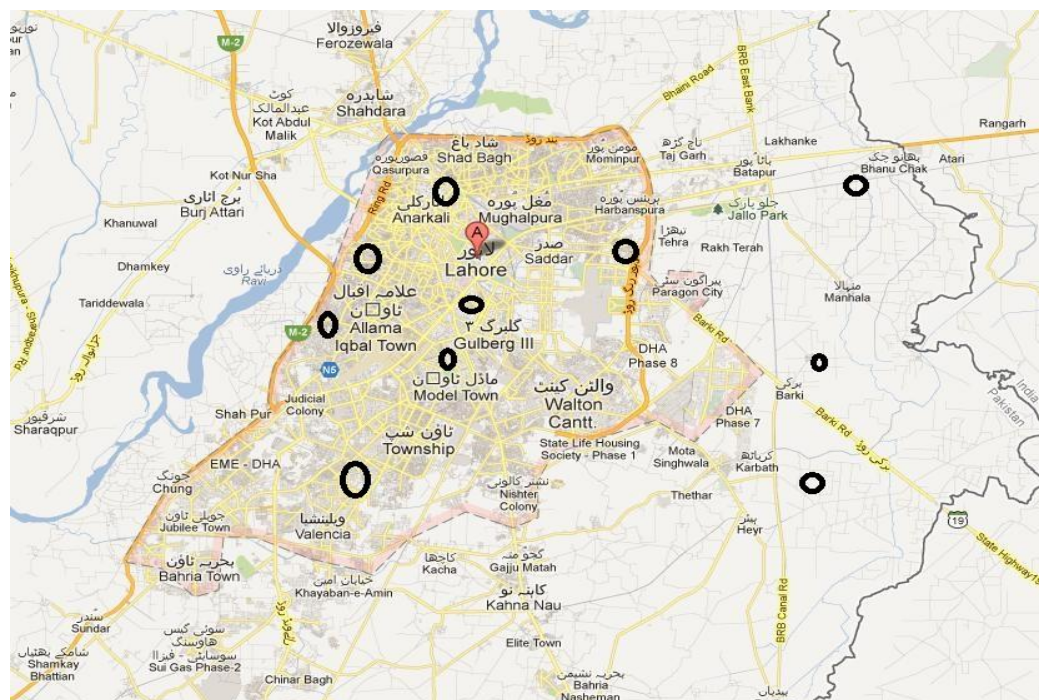


Table 1: Production rate as well as comparison of healthcare waste and healthcare system ranking

Country	Infectious waste generation (kg/bed/day)	Total healthcare waste generation (kg/bed/day)	WHO ranking of health system performance
Bangladesh	N/A	1.67	88
Brazil	0.570	3.245	125
Canada	N/A	4.1	30
Egypt	N/A	2.07	63
France	N/A	3.3	1
Ghana	N/A	1.2	135
Greece	1.4	8.8	14
India	N/A	2	112
Pakistan	0.5	2.07	122
UK	N/A	3.3	18
USA	2.79	10.7	37

Note: Data for WHO ranking of health system performance in the world (WHO 2013)

Table 2: Participants Knowledge, Attitude and Practices regarding HCWM

Participants	Knowledge	Satisfactory	Not Satisfactory
Nursing Interns		20(22%)	50 (55%)
LHVs	2 (20%)	6 (60%)	
LHWs	5 (16%)	25 (83%)	
Midwives	7 (35%)	12 (60%)	

S.Ws	Attitude	32(35%)	53 (59%)
Participants		Favorable	Un Favorable
Nursing Interns		45(50%)	45(50%)
LHVs		9(90%)	1(10%)
LHWs		21(70%)	9(30%)
Midwives	12(60%)	8(40%)	
S.Ws	Practice	26(29%)	63(69%)
Participants		Appropriate	Inappropriate
Nursing Interns		10(11%)	48(53%)
LHVs		0(0%)	8(80%)
LHWs		0(0%)	1(3%)
Midwives	0(0%)	9(45%)	
S.Ws		6(7%)	53(59%)

Others are (remaining numbers/percentage) never practice at all regarding proper waste management. Unluckily the respondents have not proper training for safe practices regarding HCWM but meanwhile one positive thing is, they all eager to learn more and attend trainings. Here is some stat (percentage) about participant’s willingness.

**Table 3: Participants interest for training regarding HCWM**

Participants	Would you like to attend training on HCWM	Yes	No
Nursing Interns			72 (80%)
LHVs		9(90%)	1(1%)
LHWs		28(93%)	2(7%)
Midwives		19(95%)	1(5%)
S.Ws		62(69%)	28(31%)

The findings about the awareness & practice regarding management of waste among Intern Nurses and sanitary workers were poor, from the above percentage it can be inferred that most the health care personals working in hospital do not have satisfactory knowledge regarding healthcare waste management practices.

Periodic training and their evaluation is mandatory for better outcome. So, this research revealed the inappropriate practices, irregularities, and shortcomings in the overall system of the WM. The study found the inconsistencies during waste management in hospitals are generally because of low amount of financial resources, poor awareness & trainings included at the administrative level.

**5. Discussion**

The present section shows the results from this study “Comparative assessment of awareness, knowledge, attitude and practices of health care WM among paramedical staff: Findings from Lahore, Pakistan”. The total sample size was (N=240). The interpretation of the collected after coded & organized data as analyzed and finally results were described.

In this section using descriptive & inferential statistics found results. The information collected from health care workers to assess their awareness, attitude and practices about HCWM because they all are directly with the contact of waste handling procedures like:, Burying, Burnings in pits, Composting, Recycling, Incineration, Chemical disinfection & Sanitary landfill etc. BMW of every health facility in every region at every level depends upon its regulations and guidelines & some other things like level of sensitivity of the health administrative management committee and current HCWM legislation & available resources at local level. According to the years of practice: Under 1 year 49 (13.6%), 1-4 yrs 132 (36.7%), 5-10 yrs 71 (19.7%) &>Then 10 yrs 108 (30.0%). All respondents of this study had performed their duties in the different shifts like 163 (45.3%) workers performed only Morning shift, 19 (5.3%), Evening and 03(.8%) night permanently.

Whereas 140 (38.9%) did work in all shifts (morning, evening & night) according to the assigned duty roaster. Remaining 35 (9.7%) were in others category, they did 8hours duty or overtime etc. especially in private health care settings.

The present study is cross-sectional and health facility- based at the different levels of health care providers like Public, Private, DHQ and THQ Hospitals, RHC and BHU of Lahore, Punjab. Healthcare providers included paramedical staff (LHVs, LHWs, nursing interns & S.Ws including cleaners and waste handlers) N=240.

In our setup, majority of healthcare workers had not received training in biomedical waste management. The effect of training as well as the educational background of respondents, on the knowledge, attitude & practices regarding BMW management is clearly evident from our study.

This finding is in accordance with the studies conducted by Kumar R et al 2018. So, the doctors can play a key role by motivating the paramedical staff to follow the optimal BMW management practices (Singh A et al 2013). Assessing the factors affecting compliance to the safe practices provide a chance to address any gaps in knowledge and practices and help in formulating strategy and necessary interventions for minimizing the risk of health hazards like hospital acquired infections or other environmental problems due to improper waste management. HCW if poorly managed may pose risk to health care workers, waste handlers, patients, and the entire community. It is a matter of concern as they are exposed to the contaminated tissues and items and could be a major source of transmission of hospital-acquired infections.

In our study most of the participants admitted that they were lacking in the proper knowledge regarding biomedical waste management. One of the important limitations of this study is the practice assessment by using self-administered questionnaires. Although self-reporting may be the simplest, easiest way and less time consuming but it always carries a risk of respondent bias who will try to report better practice than what is actually done. Declared practices may or may not reflect actual practices - only direct observation can confirm improvement of actual practices. So, further studies are suggested involving Checklist based onsite assessment through direct observation to analyse the impact of educational interventions on the actual practices of the study subjects. Further small sample size in the study makes it difficult to generalize the findings. In spite of these limitations, this study is still a good starting point for more extensive research in near future with the broad aim of improving our health care delivery system. Further studies on larger scale should be conducted to detect the gaps and lacunae in the Knowledge, attitude and practice levels and to find out the causative factors behind this and how these could be addressed for the overall improvement in BMW management practices. So, it was suggested that intensive training sessions has to be conducted regularly for all health care providers including sanitary staff which will help in better retention of knowledge and instilling a positive attitude towards biomedical waste management by repetitive reinforcement.

## 6. Conclusions

Management of BMW (biomedical waste) is a burning intention that has been neglected, especially in developing countries. But according to findings we (HCWs) have not enough knowledge, nor did satisfactory attitude/practices. "The overall findings of this study indicated that the majority of HCWs did not apply the recommended healthcare waste management practice set by WHO." (Muluken, Haimanot, & Mesafint, 2019).

Mal practices of HCWM are contributed to pollute the environment rapidly. Although Global environmental issues are increasing day by day, which is very alarming situation for the human health and life. Health care workers are a largest workforce in the all over the world and constituting more than 12% of working class over the world. A milestone study on solid waste condition in Pakistan was done by KOICA and World Bank in 2007. Problems about solid waste management were highlighted in Pakistan in that study, these issues due to inadequate regulatory institution, weak legislations, and lacks in administrative expertise and financial as well.

Because of this situation about BMW our health care workers affected directly. BMW of every health facility in every region at every level depends upon its regulations and guidelines & some other things like level of sensitivity of the health administrative management committee and current HCWM legislation & available resources at local level.

The present study is cross-sectional and health facility- based at the different levels of health care providers like Public, Private, DHQ and THQ Hospitals, RHC and BHU of Lahore, Punjab.

Healthcare providers included paramedical staff (LHVs, LHWs, Lab.Tech, OTAs & S.Ws), nursing interns (cleaners and waste handlers). Respondents were healthcare workers (HCWs) approached by stratified random sampling and their knowledge and practice regarding HCWM were assessed. Modified questions were used to attain worker's information about WM. Also direct observations of the HCFs premises inside and outside were made and noted. The research tools (questionnaire, observation & checklist) are related to the socio-demographics characteristics, knowledge, attitude and practices about HCWM. The questions related to Knowledge, Attitude and Practices were analyzed by the study population's response with the help of questions which are related to wearing PPEs (personal protection), proper management of waste disposal including infectious, sharps and general waste, response about personal hygiene. "Health care facilities ef-

fects medical waste management that operate through the direct associations between facility types and managing authority" (Dana, 2011; Hossain & Uddin, 2014; Hossain, Santhanam, Norulaini, & Omar, 2011; Patwary et al., 2011; Rashid, 1996; Rumi, 2016).

Global environment and the health related issues increasing due to the non-consistency based behavior & inadequate handling of the wastes were observed to the HCWs directly & took interviews. The minimum age of the participants was 17 years & mean & Std. Deviation age of participants was 32.5111 & 11.74662. The results showed that, there are statically significant numbers of young people with age 17-28 years 165(45.8%) who managing health care waste at all level of healthcare facilities. Greater number of the respondents with 1-4 years job experience 132(36.7%).

HCWs' awareness level, the findings showed that the mostly staff was highly qualified 148 (41.1%) Whereas 61 (16.9) had no schooling (illiterate). Total percentage of the knowledge items was 57%.

This score was not good and satisfactory completely. Only 7-8% respondents aware the different types of waste disposal methods & 5% respondents known about the symbol of Biohazard. Maximum 25% had awareness of different color codes for the different waste categories. All had heard about BMW & inadequate WM can cause diseases as well as their transmission but only 25(6.9%) had formal training on waste management. Respondents had knowledge about four color codes for disposal. 17% knew which diseases (HBV, HCV & HIV/AIDS) can be transmitted through BMWs and 83% had partially awareness about that. All of them knew about the uses of PPM. In observatory sessions, it was seen that only Yellow, Red, and White or Green colored bin were found, but many bins had contained mix waste, not segregated. Mostly bins were found to be covered. All of the participants have heard about BMW management. Fifty percent paramedics were trained while 30% and 20% were under trained and untrained, respectively. (Riaz rizwana, April 27, 2009 Accepted: October 10, 2009)

The finally level of attitude was observed unfavorable. The attitude percentage was 44%. The overall level of practice was considered unsafe because only 9.4% respondent who practice always during waste management. Unexpectedly, the maximum no. of HCWs was conscious about the protocol of BWM but they did work on improper HCWM. Adequate WM is a basic step to keep our environment clean and healthy. In the developing countries like Pakistan and Tanzania, the generation rate of BMW in basic health-care facilities was  $0.01 \pm 0.04$  kg/patient/day (WHO report).

Hospital WM rules in Pakistan were issued in 2005 & later on Solid Waste Management (SWM) practices in Lahore, provincial capital of Punjab, were privatized in 2012. Privatization has improved some components of the system. Monitoring system has been the key innovation under private sector. It has enabled better allocation, management and channelization of available resources. But still need to improvement about disposal of waste and administrative structure of waste management in the city Lahore, province & country as well.

The specialized health care & medical education (SHC&ME) dept of Govt. of the Punjab engaged LWMC to explore a convenient solution for the treatment of BMW of Lahore with keeping cordial manner of the surrounding.

The project titled "HOSPITAL WASTE MANAGEMENT SYSTEMS IN LAHORE" started. Healthcare services save lives and restore health as well. There also generate hazardous wastes to the human life & its environment. Creation & disposal of BMW have become a burning issue worldwide. Health-care institutes have a duty to keep clean & save the whole atmosphere from pollution & human lives. "Proper training should be made mandatory under supervision of Health Care Waste Committee" (Mahmood, Din, Mohsin, & Javed, 2011).

Although training sessions of HCWs about proper HCWM is a very great step. Only 25(6.9%) subjects were trained properly on HCWM that was very poor percentage. 1st step Segregation at the source, can also minimize the health related issues. Because harmful organisms are exist in the BMW, which remain in the form of spores, can lead acquired infections. This is all because of improper medical wastemanagement. "Regular training on healthcare waste management should be given to HCWs to improve the current practices". (Muluken, Haimanot, & Mesafint, 2019).

#### Health Care Waste Management Steps

- To avoid waste creation.
- To minimize the waste generation.
- To keep the waste into different categories.
- To keep containerization with color coding.
- Proper Waste Collection & Storage internally and its shifting from one place to another.
- To ensure its pre treatment & final disposal.
- To develop fast IS (Information System).
- Waste Management Plans (WMP).
- Obligations and duties.



Thus HCFs can provide a safe environment for their workers and patients, also minimize expenditure by adopting modern techniques. We have expanded existing models and methodology for sustainable strategies & waste management system. The current monitoring system and new knowledge about how a more sustainable waste management can be achieved both are important. Although, we have very short data of the HCWs, details about their occupational health & hospital-acquired infections. In this field we need more information (data). This is only possible with frequently research. After the collection of more immediate & accurate information we will be able to make policies and adopt strategies accordingly. The publicized data only tells us about the spread of disease due to contamination, dangerous Rays and Radio -active waste can cause cancer and respiratory diseases which is a serious threat to the health of HCWs.

In today's world, there are different methods being used for the WM from segregation to final disposal like incineration, , microwave disinfection, steam disinfection, autoclave disinfection, and chemical/mechanical disinfection. Monitoring System is the key factor under private administration to ensure standard management and keep a proper check & balance on activities for complete the all steps required for the management SOPs. For effective monitoring of contractors LWMC has placed different monitoring systems for the betterment of the current situation. Respondent did not access HCWM guidelines, if guidelines were present only in offices for the paper work and visitors. Practically implementation was absent. For the training purposes we can use audio visual aids according to the HCWs educational level. Ensure the presence of color-coded bins at every waste generation point & provision of the all types those bins according to the waste category.

#### Supervision:

“process of helping an individual or group in performing their assigned activities”.

Awareness & information campaigns about Segregation of Waste at Source can play the vital role. The research is designed to gaining new knowledge about what measures effective implementation of healthcare waste management systems in hospitals. But still need for follow-up studies and future research efforts. Training on WM should be given to HCWs regularly.

All staff should have access to HCWM related protocols (guidance) in their healthcare settings & directly approachable. Pre-service training can play important and result oriented role for proper WM. A health care worker must have to attend training on WM after selection for job in the any HCF. He/she have to attach training certificate with the joining report. In addition, periodic and comprehensive studies should be conducted. “The social awareness program should also focus on motivating common people to follow the rules of medical waste management for having clean healthcare facilities and for ensuring good health to all.

#### Limitations of the Study

The research did not gather supervised data on BMWM practices of Paramedical staff , but relied on self report and this may result in over reporting of correct responses. Actual knowledge, attitude and practices on BMWM might be low, but due to social desirability bias it came out to be high.

The present study shows solid WM not liquid BMWs were studied because of time & financial constraint. Also the current research is done in a short area; that's why it cannot be generalized nationwide. All HAFs observed in a single time. That was also inadequate for the authentic information for the taking actions & solid steps. One thing is also considerable this study was the use of cross-sectional data in this analysis. The disadvantage of using cross sectional data is that facility type, divisions and management authority did not truly reflect the real situation of proper disposal of BMWM. We conclude that the facility type, divisions and management authority used in this study were not the exact representative of their final disposal of BMWM. Therefore a strength of the present research is that regional variations (e.g., rural urban or divisional).

Inappropriate or wrong practices were observed at every step during handling of BMW. Mostly the main reasons are lack of appropriate legislation, shortage of expert clinical staffs, absence of knowledge & proper control. Furthermore, mostly Health Care Facilities (HCFs) in poor countries have faced money (finance) related issues. Therefore they try to adopt cost effective methods for waste disposal. The study strongly recommend that the Government should strongly consider the importance of HCWM & launching ideas in practice for convert " waste to energy" as a way of curbing the menace of WM and solving the energy needs of the public as well. There is needed to take effective and absolute steps for HCWM.

"Types of health care facilities effects medical waste management that operate through the direct associations between facility types and managing authority" (Dana, 2011; Hossain & Uddin, 2014; Hossain, Santhanam, Norulaini, & Omar, 2011; Patwary et al., 2011; Rashid, 1996; Rumi, 2016).

We finally, suggest that there is a greater need to pay attention for the proper HCWM as well as latest equipments, modern techniques and qualified & trained persons.

There is need to adopt strategies which are helpful to improve and make sure about the proper WM. All are possible with governmental support at broad level, Refresher trainings and minimize



the gaps between the communication & coordination. Other policies will also require for effective monitoring and some incentives to comply with regulations as well. 8. Limitations and Recommendations

The Pakistan Demographic and Health Survey (PDHS) is a nationally representative survey that collects information on various health indicators, including childhood vaccination. This study was based on secondary data from the PDHS 2017-18. However, like any other study, there are some limitations to consider. Although the PDHS is designed to be nationally representative, the survey may not capture specific subpopulations or regions. So, the present study also carried with this limitation. Furthermore, this study analyzed only the parental demographic attributes of incomplete childhood vaccination but did not collect detailed information on the reasons why some children could not receive certain vaccinations. This information could provide valuable insights into barriers to vaccination and inform targeted interventions. The PDHS is conducted every few years, so the data of the present study may need to reflect current vaccination coverage rates. As a result, it is critical to keep these limitations in mind when conducting future re-search studies in Pakistan.

**Authors contributions:** Assia Riaz participated in idea conception, proposal development, data collection and writing manuscript review, editing, supervision and original draft preparation. Faisal Malik Ajaib participated to develop the questionnaire. Raja Zubair participated in methodology, developing manuscript and formal analysis. Kiran Hameed participated in visualization and supervision. Tahira Mariam participated in data collection and investigation. All authors have read and agreed to the published version of the manuscript.”

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**Institutional Review Board Statement:** Ethical clearance Letter No. 1149/E II, for the data collection was obtained by the institutional heads & participants individually. Confidentiality and privacy of the participants was maintained in the present study, so that the participants answered in realistic & very comfortable way. Ethical clearance was also obtained from the Institutional ‘heads. Formal letter was written from Punjab University and given to health facilities where we have to work also Written informed consent has been obtained from the Healthcare Workers individually basis.

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