

**Original Article****The Knowledge, Attitude and Practice of Nurses, Technicians and Sanitary Workers Regarding Biomedical Waste Management at Healthcare Establishments of Dera Ismail Khan, Pakistan****Samina Qadir¹, Rahila Bano², Anil Iqbal¹, Muhammad Saddozai³, Maira Gul³, Muhammad Younis³, Fatima Dastageer³, Muhammad Mussab³ and Maheen Noor³**¹Department of Community Medicine, Gomal Medical College, Dera Ismail Khan, Pakistan²Department of Pathology, Gomal Medical College, Dera Ismail Khan, Pakistan³Gomal Medical College, Dera Ismail Khan, Pakistan**ARTICLE INFO****Keywords:**

Paramedics, Healthcare Workers, Waste Management, Attitude

How to Cite:Qadir, S., Bano, R., Iqbal, A., Saddozai, M., Gul, M., Younis, M., Dastageer, F., Mussab, M., & Noor, M. (2024). The Knowledge, Attitude and Practice of Nurses, Technicians and Sanitary Workers Regarding Biomedical Waste Management at Healthcare Establishments of Dera Ismail Khan, Pakistan: Biomedical Waste Management among Healthcare Workers. *Pakistan Journal of Health Sciences*, 5(05). <https://doi.org/10.54393/pjhs.v5i05.1439>***Corresponding Author:**Samina Qadir
Department of Community Medicine, Gomal Medical College, Dera Ismail Khan, Pakistan
saminaqadir5@gmail.comReceived Date: 3rd April, 2024Acceptance Date: 23rd May, 2024Published Date: 31st May, 2024**ABSTRACT**

Risk waste generated in hospitals can cause some serious health and environment related problems, if not disposed properly. **Objective:** To assess the knowledge, attitude and practice of healthcare workers regarding Biomedical Waste (BMW) management and to find out any significant difference across different sociodemographic variables. **Methods:** This was a cross sectional study conducted from 20th February to 20th August 2023. Sampling technique was consecutive non probability with a sample size of 287. Research variables were knowledge, attitude and practice. T-test and One-way ANOVA test were used to show statistically significant difference between research variables across demographic variables at p-value of ≤ 0.05 . **Results:** 287 health care workers participated in this study. Around 84% nurses, 78% technicians and 64% sanitary worker have good knowledge about BMW management. Remaining participants had fair knowledge and none of the health care workers in any category had poor knowledge about BMW. 83% of the total participants from all three categories of workers had a good attitude regarding BMW management whereas around 16.7% participants had a fair attitude while 0.3% had a poor attitude. However, only 1% had good practices while 62% had poor practice and the remaining 37% participants had fair practice. It was found there was a statistically significant association of the category of workers with knowledge. **Conclusions:** The healthcare workers have good knowledge and attitude regarding BMW disposal but the practice was either fair or poor.

INTRODUCTION

Biomedical Waste (BMW) means any waste which is generated during diagnosis, treatment and immunization of human beings or animals or in a research activity pertaining there to or in the production or testing of biologicals [1]. BMW is a collective term used for all waste generated in different healthcare establishments [2]. Waste management is various measures taken in generation, segregation, collection, storage, transportation to final disposal of BMW to ensure safety of exposed humans and environment [3]. BMW is classified into risk waste and non-risk waste. Approximately 75-90% waste generated from healthcare establishments is non

risk waste and 10-25% waste is risk waste. Health care staff, visitors to health care establishments, support staff, scavengers, community in general and its environment all are at risk of getting exposure to sharps, infectious, corrosive, toxic, inflammable, genotoxic and radioactive waste [1]. Globally almost every country produces BMW at an average of 0.5 to 3 kg/bed/day [4]. In Pakistan the rate of BMW generation is approximately 0.5 to 2.0 kg/bed/day [5]. It is different composition of BMW which makes it an issue of serious concern [6]. There is also a huge risk of reuse of the syringes and IV tubes as a result of improper management. Those who either handle BMW at some stage

or exposed to this as a result of careless management, are prone to some serious infections like AIDS, hepatitis B and hepatitis C etc. [2]. Approximately 16 billion injections are administered per year worldwide and many of them are not disposed properly, creating a risk to reuse these syringes. In 2010, 33,800 new HIV cases, 1.7 million hepatitis B infections and 315,000 new hepatitis C cases were reported due to these reused syringes [7]. According to a joint WHO/UNICEF assessment, if an already used syringe is administered to a patient, it has 30% risk of developing hepatitis B, 1.8% risk of hepatitis C and 0.8% risk of developing HIV infections. According to a report, based on data collected from 24 different countries, approximately 58% have adequate systems for the safe disposal of BMW and the rest do not [8]. In most hospitals of Pakistan, there is a great rush of patients and a huge amount of BMW is generated which is not managed properly [5]. Good knowledge attitude and practice of health care workers towards BMW are a must requirement [3]. BMW is a serious concern especially in developing countries. A lot of work and research studies have been done on knowledge, attitude and practice of health care workers regarding BMW management both nationally and internationally but no research has been done regarding this in the city of Dera Ismail Khan. This knowledge gap is our rationale.

Our objectives were to assess the knowledge, attitude and practice of healthcare workers, to find out any statistically significant difference of knowledge, attitude and practice score across different sociodemographic variables.

METHODS

It was a cross-sectional study design. Study setting was Community Medicine Department, Gomal Medical College Dera Ismail Khan. The duration of our research was from 20 February to 20 August, 2023. Ethical approval was obtained from the Ethical Review Committee (ERC) of the institute. Study population was staff working in healthcare establishments of D.I. Khan which includes nurses, technicians and sanitary workers. The sampling technique used in this research is non-probability consecutive sampling. The inclusion criteria for our research include the nurses, technicians and sanitary workers, working in healthcare establishments of D.I. Khan. The exclusion criteria were those who didn't give consent and those with a work experience of less than 6 months. According to the Raosoft et al., sample size calculator, keeping the confidence level of 95%, margin of error 5.75% and response rate of 50%, our sample size was 287. Ethical approval was granted by Ethical Review Committee (ERC) through Letter No: 183/GJMS/JC. Data collecting tool was a questionnaire having two portions, one for research variables and other for demographic variables. The research variables were knowledge, attitude and practice

of health care personnel regarding hospital waste disposal. These were assessed on 5 point Likert Scale by 20 items (10 items for knowledge, 3 items for attitude and 7 items for practice). Practice items were different for different category of workers depending on their role in waste management. Means of scores were calculated for research variables. Minimum mean score was 1 and maximum mean score was 5 for each research variable. Score of 1 to 2.4 was considered Poor. Score of > 2.4 to 4 was considered as Fair. Score > 4 to 5 was considered as Good. The demographic variables included category of workers with three attributes (nurses, technicians, sanitary workers). Age with two attributes (Greater than 40 years or less than 40 years), gender with two attributes (male or female). Years of experience with two attributes (6 months to 1 year or > 1 year). Descriptive analysis for quantitative continuous variables was done by calculating their mean and standard deviation. Demographic variables were discrete and were expressed in terms of frequency and percentages. Inferential analysis was done by assessing the statistically significant difference between research variables across demographic variables, we used an independent sample T-test for dichotomous variable except for the category of workers (multichotomous) where we used one-way ANOVA test. Data analysis was done using SPSS version 24.0.

RESULTS

In table 1, total of 287 Health Care Workers (HCW) from health care establishments of Dera Ismail Khan participated in this study. Out of 287, 152 (53%) were nursing staff, 79 (28%) were technicians and 56 (19%) were sanitary workers (n= 287). Demographic information showed that around 42% were male, female healthcare workers accounted for 58% of the total. With respect to working experience, the 91% of the health care workers had greater than 1 year of experience whereas only 9% had been working in a hospital setting for less than 1 year. 31% of the participants were older than 40 years whereas the remaining 69% were younger than 40 years.

Table 1: Demographic Characteristics of Participants

Variables	Nurses N (%)	Technicians N (%)	Sanitary Workers N (%)	Total N (%)	
Age	> 40 Years	36 (38%)	26 (30%)	31 (32%)	93 (100%)
	< 40 Years	116 (60%)	53 (26%)	25 (14%)	194 (10%)
Gender	Male	14 (11%)	64 (52%)	45 (37%)	123 (100%)
	Female	138 (83%)	15 (10%)	11 (7%)	164 (100%)
Years of Experience	6 Months to 1 Year	11 (48%)	6 (24%)	7 (28%)	24 (100%)
	> 1 Year	141 (53%)	73 (27%)	49 (20%)	263 (100%)

Mean score of knowledge 4.45, 4.43, 4.19 and attitude 4.67, 4.63, 4.53 of nurses, technicians and sanitary workers respectively was good. But the practice score of nurses,

technicians and sanitary workers was 2.4, 2.4 and 2.26 respectively which was poor. Mean knowledge score was 4.41, 4.38 and attitude score 4.64, 4.61 by age of health care workers aged <40 years and >40 years respectively, which was good. But the practice in both categories was again poor. The mean practice score of workers aged greater than 40 years was 2.38 whereas the practice of workers age less than 40 years was 2.39. Mean of KAP score with regard to gender followed the similar trend where knowledge and attitude had good mean scores relative to practice scores which was poor. Males had a score of 4.347 of knowledge, 4.575 of attitude and only 2.345 of practice. On the other hand, females had a score of 4.441 of knowledge, 4.681 of attitude and only a 2.378 of practice. Those who had experience of 6 months to 1 year, had a mean score 4.26 of knowledge, 4.52 of attitude and only 2.22 of practice. On the other hand, those who worked for greater than 1 year had a score of 4.41 of knowledge, 4.64 of attitude and only a 2.31 of practice (table 2).

Table 2: Mean and Standard Deviation of KAP Score by Category of Sociodemographic Variables

Category	Number of Respondents	Knowledge (Mean ± SD)	Attitude (Mean ± SD)	Practice (Mean ± SD)
Workers				
Nurses	152	4.45 ± 0.39	4.67 ± 0.49	2.42 ± 0.58
Technicians	79	4.43 ± 0.38	4.63 ± 0.47	2.43 ± 0.81
Sanitary Workers	56	4.19 ± 0.46	4.53 ± 0.55	2.26 ± 0.53
Age				
< 40 Years	197	4.41 ± 0.41	4.64 ± 0.49	2.39 ± 0.65
> 40 Years	90	4.38 ± 0.43	4.61 ± 0.52	2.38 ± 0.63
Gender				
Male	120	4.34 ± 0.41	4.57 ± 0.50	2.34 ± 0.69
Female	167	4.44 ± 0.41	4.68 ± 0.50	2.37 ± 0.61
Years of Experience				
6 Months to 1 Year	25	4.26 ± 0.38	4.52 ± 0.69	2.22 ± 0.47
>1 Year	262	4.41 ± 0.41	4.64 ± 0.48	2.31 ± 0.65

In table 3, after applying one-way ANOVA test there was statistically significant difference of knowledge in different categories of workers with degree of freedom 2, F value of 8.802 and p value of 0.00 between groups. Results showed that there was no statistically significant difference between the category of workers and their attitude and practice as p value was 0.180 and 0.220 respectively. After applying the t-test, there was no statistically significant difference of knowledge, attitude and practice by age groups as the p value was greater than 0.05. Similarly, there was no statistically significant difference of knowledge, attitude and practice across gender as the p-value was greater than 0.05. Furthermore, there was no statistically significant difference of knowledge, attitude and practice by years of experience as the p value was 0.094, 0.224 and 0.160 respectively.

Table 3: Difference of KAP Score by Age Groups

Variables	T Test Value	p-Value
Category of Workers (Nurses, Technicians, Sanitary Workers)		
Knowledge	8.808	0.000
Attitude	1.724	0.180
Practice	1.520	0.220
Age Groups (< 40 years; > 40 years)		
Knowledge	0.514	0.607
Attitude	0.511	0.610
Practice	0.99	0.921
Gender (Male, Female)		
Knowledge	1.8862	0.060
Attitude	1.775	0.077
Practice	1.083	0.280
Years of Experience (6 Months to 1 Year; > 1 Year)		
Knowledge	-1.679	0.094
Attitude	-1.218	0.224
Practice	-1.409	0.160

In table 4, results findings showed that 84% nurses, around 78% technicians and around 64% sanitary workers had good knowledge about biomedical waste, its types, importance of its segregation and the health hazards resulting from its improper disposal. Remaining participants had fair knowledge and none of the health care worker in any category had poor knowledge. Furthermore, 83% percent of the total participants from all three categories had good attitude regarding BMW management whereas around 16.7% participants had fair attitude. While 0.3% showed poor attitude. However, majority of the participants 62% had poor practice with regards. To safe BMW management including segregation, vaccination, disinfection of waste, use protective equipment among other practices. Despite having adequate knowledge of BMW, only 1% of the health care workers were found to have good practice while 37% of them had fair practices.

Table 4: KAP Levels among Healthcare Professionals

Variables	Nurses N (%)	Technicians (%)	Sanitary Workers (%)	
Knowledge	Good	84%	78%	64%
	Moderate	16%	22%	35%
	Poor	-	-	-
Attitude	Good	83%	83%	83%
	Moderate	16.7%	16.7%	16.7%
	Poor	0.3%	0.3%	0.3%
Practice	Good	1%	1%	1%
	Moderate	37%	37%	37%
	Poor	62%	62%	62%

As shown in figure 1, although the mean score of practice is less overall, the mean score of workers with regards to washing hands is relatively high that is 4.68. But the mean score of practices like segregation of waste, disinfection and training of workers on BMW management is relatively

poor with mean score of these being less than 2. But the mean score of use of personal protective measures and vaccination of workers is 3.07 and 2.81 respectively which falls between the practices mentioned above and was fair.

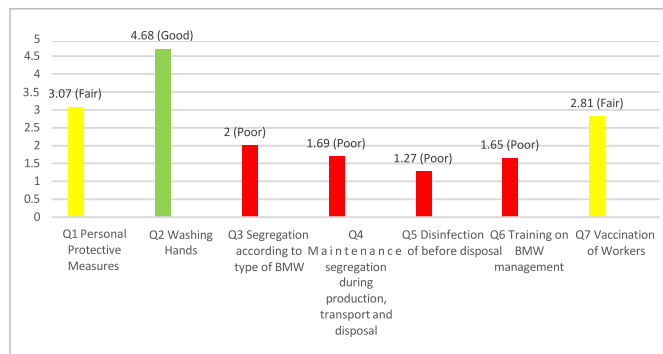


Figure 1: Mean Score of Individual Items of Practices of Health Care Workers

As per our operational definition of good, fair and poor, although the mean score of practice was less overall, the mean score of workers with regards to washing hands was relatively high that is 4.68. But the mean score of practices like segregation of waste, disinfection and training of workers on BMW management was relatively poor with mean score of these being less than 2. But the mean score of use of personal protective measures and vaccination of workers was 3.07 and 2.81 respectively which falls between the practices mentioned above and was fair.

DISCUSSION

The study was conducted to assess the knowledge, attitude and practice of biomedical waste management in the health care establishments. It is vital to comprehend the significance of proper bio medical waste management in healthcare facilities since biochemical waste is found to have a hazardous impact on both the environment and human health. Not only are fundamental changes like adopting new regulations and choosing the most up-to-date safe management equipment is required, but a general understanding of proper waste disposals is also crucial. The study identifies certain inadequacies in knowledge, attitude and practice of healthcare workers. Despite majority of them having good or fair knowledge and attitude, our participants depicted poor practice. Overall, according to our study all 3 categories of workers only managed to acquire only 1% good practice which meant that only 3 people out of 287 followed proper protocols. Most of the participants showed good practice of washing hands with means scores 4.68. These results are similar to results of study conducted by Akkajit *et al.*, in which 95.6% of respondents claimed to wash hands after handling waste. Regarding wearing of personal protective equipment and vaccination mostly showed fair practice with a score of 3.07 and 2.81 respectively in our study. Again,

these results agree with results of Akkajit *et al.*, in which 93.6% respondents claimed to wear gloves for their protection [9]. But practices of our respondents regarding segregation, disinfection and training were astonishingly poor with the question with regards to disinfection of waste before disposal having the mean score as low as 1.27 and the question concerning training having score of 1.65. This all is very alarming for our district as improper segregation can lead to several health related hazards. Risk waste if mixed with non-risk waste produced in hospitals can convert all waste into hazardous waste both for humans and environment. A study conducted in large private and public sector hospitals in Rawalpindi and Islamabad regarding biomedical waste management reported that the practices were not up to the standards of WHO and Pakistan Biosafety rules 2005 [10]. Waste generated in health care establishments of low-income countries is not on the priority list of health-related issues of those countries [11]. Majority of our participants in our study, despite having good knowledge and attitude, depicted poor practice. This is in contrast with study done by Sekar M *et al.*, according to which health care workers had good co relation of knowledge with practice [12]. Poor practice may be attributed to lack of supplies or reckless attitude of workers. It was observed that most of the workers regardless of age and duration of experiences did not practice waste segregation, disinfection before disposal of biomedical waste. Furthermore, they hadn't received proper training regarding BMW safe disposal as well. A similar study at Alexandria Ambulatory Clinics revealed that none of the studied subjects received training in health-care waste management yet all of them were knowledgeable regarding the color coding used for segregation of waste [13]. Our study results also agree with study done by Soyam GC *et al.*, in which respondents had good knowledge and positive attitude towards safe waste disposal [14]. There was a statistically significant association of the category of workers with knowledge in our study and this finding agree with results of study done by Mehta TK *et al* [15]. A study done by Mariam Q *et al.*, also reported more than three fourth of respondents were having good knowledge of waste disposal steps [16]. The study of Harhay *et al.*, showed that six countries including China, India, Brazil, Pakistan, Bangladesh and Nigeria, were found to be facing unsafe BMW disposal issues [17]. Reasons for these issues are diverse from lack of interest from the hospital administration to poor practices of concerned people and economic issues in implementation of healthcare policy from the government. Although 20 years ago, WHO issued documents assessing in improving the waste management from hospitals but unfortunately did not trigger any change in Pakistan [18]. In a study done

by Mandal R *et al.*, 80.7% nursing staff showed the highest score of knowledge and these results are close to our findings with 84% of nurses showed good knowledge [19]. But in a study done by Deress T *et al.*, 45% of waste handlers had adequate knowledge, 78% had positive attitude and 80% had fair practice and practice score was higher as compared to our study in which 37% of HCW showed adequate practice [20].

CONCLUSIONS

This study concluded that although our participants had sufficient knowledge of safe biomedical waste disposal and a positive attitude towards it, but there were unsettling results regarding their practice. Only 38% of health care workers showed adequate practice (good and fair practice combined). It was revealed that there was a statistically significant association of the category of workers with knowledge.

Authors Contribution

Conceptualization: SQ, RB, AI

Methodology: SQ, RB, AI, MS

Formal analysis: SQ, AI, MG, MY, FD

Writing-review and editing: SQ, MS, MG, MY, FD, MM, MN

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

- [1] Park K. Park's textbook of preventive and social medicine. Preventive Medicine in Obstet, Paediatrics and Geriatrics. 23rd Edition. Bhanot Publishers. 2005.
- [2] Ilyas Ansaris. Public health and community medicine. 8th Edition. Karachi Pakistan: Time Publishers; 2016: 444.
- [3] Uloma AA, Nkem Benjamin I, Kiss I. Knowledge, attitude and practice of healthcare workers towards medical waste management: a comparative study of two geographical areas. *Journal of Waste Management and Disposal*. 2022; 5: 101. doi: 10.18875/2641-8827.5.101.
- [4] Saadoon NB, Kadum SA, Ali LH. Knowledge and Attitudes of Healthcare Workers regarding Medical Waste Management in Hospitals of Al-Najaf Province. *Health Education and Health Promotion*. 2022 Sep; 10(4): 649-56.
- [5] Mahmood S, ud Din N, Mohsin J, Javed H. Practices regarding hospital waste management at public and private sector hospitals of Lahore. *Annals of King Edward Medical University*. 2011; 17(2): 113. doi: 10.21649/akemu.v17i2.283.
- [6] Rao D, Dhakshaini MR, Kurthukoti A, Doddawad VG. Biomedical waste management: A study on assessment of knowledge, attitude and practices among health care professionals in a tertiary care teaching hospital. *Biomedical and Pharmacology Journal*. 2018 Sep; 11(3): 1737-43. doi: 10.13005/bpj/1543.
- [7] Pepin J, Abou Chakra CN, Pepin E, Nault V, Valiquette L. Evolution of the global burden of viral infections from unsafe medical injections, 2000-2010. *Public Library of Science One*. 2014 Jun; 9(6): e99677. doi: 10.1371/journal.pone.0099677.
- [8] Lineberger H, Cronk R, Kpodzro S, Salzberg A, Anderson DM. Does WASH FIT improve water, sanitation, and hygiene and related health impacts in healthcare facilities? A systematic review. *medRxiv*. 2024: 2024-04. doi: 10.1101/2024.04.05.24305396.
- [9] Akkajit P, Romin H, Assawadithalerd M. Assessment of knowledge, attitude, and practice in respect of medical waste management among healthcare workers in clinics. *Journal of Environmental and Public Health*. 2020 Sep; 2020. doi: 10.1155/2020/8745472.
- [10] Alam MM, Sujauddin M, Iqbal GM, Huda SM. Report: healthcare waste characterization in chittagong medical college hospital, Bangladesh. *Waste Management and Research*. 2008 Jun; 26(3): 291-6. doi: 10.1177/0734242X07087661
- [11] Kumar R, Somrongthong R, Ahmed J, Almarabeh AJ. Correlates of knowledge, attitude and practices about health care waste management among hospital workers of Pakistan. *Journal of Liaquat University of Medical and Health Sciences*. 2018; 17(01): 1-7. doi: 10.22442/jlumhs.181710541.
- [12] Sekar M, Swapna M, Easow JE. A study on knowledge, attitude and practice of biomedical waste management among health care workers in a Tertiary Care Hospital in Puducherry. *Indian Journal of Microbiology Research*. 2018; 5(1): 57-60. doi: 10.18231/2394-5478.2018.0011.
- [13] Soliman SM, Mostafa MA, Ibrahim HZ. Medical waste management situation at alexandria ambulatory Clinics. *IOSR Journal of Nursing and Health Science*. 2016 Sep; 5(05): 1-9. doi: 10.9790/1959-0505050109.
- [14] Soyam GC, Hiwarkar PA, Kawalkar UG, Soyam VC, Gupta VK. KAP study of bio-medical waste management among health care workers in Delhi. *International Journal of Community Medicine and*

- Public Health. 2017 Aug; 4(9): 3332. doi: 10.18203/2394-6040.ijcmph20173840.
- [15] Mehta TK, Shah PD, Tiwari KD. A knowledge, attitude and practice study of biomedical waste management and bio-safety among healthcare workers in a tertiary care government hospital in western India. *National Journal of Community Medicine*. 2018 May; 9(05): 327-33.
- [16] Mariam Q, Ahmed N, Abbasi MS, Nadeem R, Rizwan A, Vohra F *et al*. Safe practices of biomedical and dental waste management amongst practicing dental professionals amid the COVID-19 pandemic. *Work*. 2022 Jan; 71(4): 851-8. doi: 10.3233/WOR-211099.
- [17] Harhay MO, Halpern SD, Harhay JS, Olliaro PL. Health care waste management: a neglected and growing public health problem worldwide. *Tropical Medicine and International Health*. 2009 Nov; 14(11): 1414-7. doi: 10.1111/j.1365-3156.2009.02386.x.
- [18] Khalid S, Haq N, Sabiha ZU, Latif A, Khan MA, Iqbal J *et al*. Current practices of waste management in teaching hospitals and presence of incinerators in densely populated areas. *BMC Public Health*. 2021 Dec; 21: 1-0. doi: 10.1186/s12889-021-11389-1.
- [19] Ramkrishna M and Satyanarayana P. Knowledge, Attitude and Practice (KAP) Study Regarding Bio-Medical Waste Management Among Staff in a Tertiary Care Hospital at Andhra Pradesh. *Asian Journal of Management*. 2018; 9(1): 267-71. doi: 10.5958/2321-5763.2018.00040.9.
- [20] Deress T, Jemal M, Girma M, Adane K. Knowledge, attitude, and practice of waste handlers about medical waste management in Debre Markos town healthcare facilities, northwest Ethiopia. *BMC research notes*. 2019 Dec; 12: 1-7. doi: 10.1186/s13104-019-417.