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Knowledge, Attitude and Practices regarding Biomedical Waste Management among Health Care Professionals of Private Sector Hospitals in Pakistan

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Abstract: This study aimed to determine the level of awareness, mindset, and activities regarding biomedical waste management among health care providers and professionals of private sector hospitals in Pakistan. Hospitals are the centers of taking care of public health. However, at the same time, they generate hazardous biomedical waste. A descriptive cross-sectional study was carried out among health care professionals. The sample was collected by using multistage random sampling. Among all participants studied mean age was (29.56 ± 7.59). The majority of the respondents had good knowledge (64.7%), the OT department had good knowledge (26%), while knowledge of the nurses was (33%). Over the Confident attitude of the respondents were (53%), respondents from the OT department had a confident attitude (28%) while nursing staff had a confident attitude of (39%). Overall good practices of the respondents were (65%), OT department had good practices (30%) whereas nursing staff also had good practices (41%). The relationship between experience and attitude, awareness and practices, and attitude and practices was found to be statistically relevant at (p = 0.05). Our study concluded that healthcare professionals' knowledge and practices scores were satisfactory, but healthcare professionals' attitude was somehow low. The satisfactory score of knowledge, attitude and practices was observed higher amongst nurses compared to other healthcare professionals; this may be attributed to increased interest in biomedical waste management.

Keywords: Biomedical waste, Attitude, Knowledge and practices, Health care professionals

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INTRODUCTION

During the healthcare delivery system, healthcare organizations can inevitably generate hazardous Biomedical Waste (BMW) to humans or the environment. This waste is commonly classified as general (non-hazardous) and hazardous waste. General waste constitutes 85% of total waste, while the remaining 15% is hazardous waste (Ayuningrat, Noermijati., & Hadiwidjojo, 2016; Chartier, 2014). Currently, there are numerous terms used to describe waste generated by healthcare institutions, such as clinical waste, medical waste, infectious waste, medical waste, and biomedical waste. However, biomedical waste is the most commonly used term in most articles (Hossain, Santhanam, Norulaini, & Omar, 2011). Biomedical waste is described as waste generated during the diagnosis, medication or immunization of humans or animals or in related research activities, or in the production and testing of biological products, and is contaminated with human fluids (Deress, Hassen, Adane, & Tsegaye, 2018; Zhang et al., 2020).

Medical assistance is essential for our existence and health; However, waste from healthcare activities contains a wide variety of substances, from used needles and syringes to dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices, and dirty radioactive substances. Healthcare is vital to our life and health, however waste from healthcare activities and poorly organized healthcare waste potentially expose healthcare workers, waste handlers, patients and the community at large to infections, injuries, poisonous outcomes and injuries and risk to pollute the environment

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(Tesfahun, Kumie, & Beyene, 2016). Via sharp instruments or other infected products, hazardous waste can transmit infections like hepatitis B and C, HIV, and other viral infections (Chartier, 2014).

Contagious waste use can also cause extended hospitalization, miscarriage, genital anomalies, hormonally caused tumors, mutagenicity, dermatitis, asthma, and neurological problems in children. Bad medical waste disposal activities by healthcare workers often add to contamination when hospital waste discarded within hospital buildings is frequently set on fire, resulting in the release of toxic chemicals into the air.

Medical waste management procedures, such as waste generation, packaging, handling, segregation, and recycling, are generally below global and World Health Organization (WHO) levels in developed countries such as Pakistan, India, China, and Bangladesh (Kumar, Somrongthong, & Ahmed, 2016; Tahir & Athar, 2018). The total medical waste generated in most developing countries ranges from 0.5 to 3 kg per person/year 2, while healthcare facilities in Pakistan generate around 2 kg/bed/day of waste; of which 0.1-0.5 kg are infectious waste (Fatima & Asad, 2018). In Pakistan hospitals generates around 250,000 tons of waste annually. It has been stated that hospital waste is handled improperly by the hospital staff and management respectively (Kumar et al., 2010).

In Pakistan, despite the presence of the 2005 Pakistan Biosafety Rules, adequate hospital waste management systems have not been developed in several health care facilities, nor are healthcare professionals and relevant managers aware of the seriousness of the resulting situation (Fatima & Asad, 2018). Research indicates that doctors and health management were totally negligent and ignored basic waste disposal methods. Consequently, medical waste management works to abolish the dangerous practice of incineration, as well as to minimize the quantity and toxicity of all waste streams generated by hospitals (Anwar, Malik, & Asim, 2013). Healthcare professionals, patients, waste managers, recyclers and the masses in general are vulnerable to the development of these infections. Sharp waste such as needles and syringes, if not disposed of properly, creates a risk of injury and infection and opportunities for reuse. Despite these advances, unsafe injections were responsible for up to 33,800 new HIV infections, 1.7 million hepatitis B infections, and 315,000 hepatitis C infections in 2010. A person who suffered from a needle stick injury used in an infected patient has a 30%, 1.8% and 0.3% risk, respectively of becoming infected with HBV, HCV and HIV infection (Ajai & Nath, 2013). A study suggested that about 52 percent of the doctors had received needle-stick injuries more than once in their lifetime (Usmani et al., 2010).

Healthcare workers in the lower ranks of healthcare in Pakistan suffer from sharp injuries even worse than those in hospitals, and about 54 percent of healthcare workers have suffered at least one injury within six months in first level care centers (Janjua, Khan, & Mahmood, 2010). In the country's leading national newspaper, it has been reported that although there are rules educating the safe method of disposal of BMW, hospital waste generated by government hospitals is largely being dumped in outdoors and accumulated along with the general waste (Anwar et al., 2013). Based on these results, the implementation of an advanced biomedical waste management system for healthcare organizations had become a priority. cross-cutting issue (Nema, Pathak, Bajaj, Singh, & Kumar, 2011). Therefore, the accurate disposal of medical waste using modern methods is strongly recommended (Shi, Liu, Li, & Xu, 2017). Knowledge and safe practices of medical professionals are highly indispensable when dealing with biomedical waste. Relevant correlations of inadequate medical waste management is needed to be identified, to inform hospitals and other health institutions in developing countries for better medical waste management. However, little is known about the multiple factors and their correlates responsible for an inadequate KAP with regard to the management of medical waste among health workers in developing countries, including Pakistan.

As a result, the goal of this study was to determine the level of awareness, mindset, and activities regarding biomedical waste management among health care providers and professionals of private sector hospitals in Pakistan. The findings of this KAP study will be presented to the managers of the private sector hospitals for the better management of biomedical waste.

RESEARCH METHODOLOGY

This was a cross-sectional descriptive study based on pre structured questionnaire with the help of previous studies comprise of open ended and close ended questions. To access the knowledge, attitude and practices regarding biomedical waste management among the health care professionals of the private sector hospitals of twin cities in Pakistan.

Ethical approval and clearance for the study was obtained from the Institutional Ethics Committee. Written formal informed consent which enlightened the Goals and objectives of research was taken from all the members. Before the actual data collection, a pilot research was conducted to assess the dependability of the questionnaire. The pilot study which was conducted consists of After receiving formal approval, a pre-tested standardized questionnaire was circulated to 20 participants and professional workers. The Cronbachs Alpha of the questionnaire was 0.776(77.6%).

Calculated sample size of the study was 300 and Sample was collected by using multistage random sampling method. At first stage through simple random sampling six hospitals were selected from twin cities (three from Rawalpindi and three from Islamabad). At the second stage participants were selected through stratified random sampling. Health-care workers were divided into four strata/subgroups. (Doctors, Medical technologist, Nurses and paramedics). In third stage by using non-probability convenient sampling with seventy five members from each hospital Whole data/sample of the study was collected from health care professionals of private sector hospitals of twin cities in Pakistan. After coding obtained filled questionnaires from health care professionals data was entered and analyzed by using SPSS version 22.

RESULTS

Detail of demographic variables

A detail of demographic characteristics of sample has been given in Table 1. The minimum and maximum age of the respondents was (22-64) and the mean age was 29.50 years. Minimum and maximum experience was (1-34) and mean experience was 7.23. Majority of participants were male 53% and majority of the participants was nursing staff 37% whereas majority of the respondents were from the OT department 26%. Which is the central department of biomedical waste generation.

Cut off limit for the calculation of KAP regarding biomedical waste

To access the knowledge, attitude and practices of healthcare professionals regarding biomedical waste management, a mean value is decided to serve as a cut off limit mean; SD and range were also calculated by the help of spss. The ranges for knowledge domain were 2-8 and mean score was (6.533±1.235) and median score was 7. The range for attitude domain was 11-45 and mean score was (34.864±6.310) and the median score was 37 whereas the range for practices domain was 2-10 and mean score was (6.84 ±1.721) and median score was 7.

Table 1: Summary of the goodness of fit of the models

Characteristics		Frequency (n)	Percent (%)
Gender	Male	159	53
	Female	141	47
Occupation	Doctors	81	27
	Nursing staff	111	37
	Medical technologist	61	20.3
	Paramedics	47	15.7
Department	OT	78	26
	ICU	69	23
	Medical	63	21
	Radiology	44	14.7
	Laboratory	46	15.3

To calculate the proportion of knowledge, attitude and practices of HCPs regarding BMWM, median of each domain score was used. The proportion of HCPs who scored above and below the cutoff limits for good Knowledge was 194 (44.7%) and for the poor knowledge was 106 (35.3%). The proportion of HCPs who scored above and below the cutoff limits for confident attitude was 160(53.3%) and for less confident attitude was 140 (46.7%). However the proportion of HCPs who scored above and below the cutoff limits for good practices were 196(65%) and HCPs who had poor practices were 104 (35%).

Sociodemographic variables in correspondence with good & poor KAP

Table 2 shows the proportion of knowledge, attitude and practices in terms of socio-demographic with correspondence of good and poor KAP. In terms of Ages 20-28 years aged respondents had good knowledge of 121(62.37%), confident attitude of 92(57%) and good practices of 125(64%). In terms of Socio-demographic variable gender towards KAP. Males had good knowledge of 109(56.18%), while females had satisfactory attitude of 82(51.5%) & females had also good practices of 113(58%). In terms of Socio- demographic variable experience of HCPs participants with 1-7 years experience had good knowledge of 122(64%), satisfactory attitude of 119(63%) and good practices of 113(58%). However in terms of Socio- demographic variable department towards KAP. Respondents from operation theater department had good knowledge of 50(26%), satisfactory attitude of 44(28%) and good practices of 59(30%). While in terms of Socio-demographic variable occupation towards KAP. Nursing staff had good knowledge of 98(33%), satisfactory attitude of 62(39%) and good practices of 81(41%) concerning biomedical waste management.

However in terms of awareness about spread of infections due to mishandling of waste and waste handling time of biomedical waste management towards KAP regarding biomedical waste management with correspondence of cutoff limits. In terms of waste handling time respondents who reply on 12 hours of time had good knowledge of 126(65%), Confident attitude of 93(59%) and good practices of 108(55%) whereas in terms of awareness about spread of infections due to mishandling of waste.

Respondents who respond on spread of hepatitis C infection because of mishandling of biomedical waste had good knowledge of 81(42%), confident attitude of 64(41%) and good practices of 82(42%) regarding biomedical waste management.

Association between socio-demographic with KAP

There was significant association found amongst socio-demographics towards attitude, knowledge and practices regarding biomedical waste management as the $p < 0.05$.

One of the aims of this research was to see whether there was any connection between awareness and attitude, Health professionals' expertise and practices, as well as their mindset and practices, on biomedical waste management Correlations were measured using data, and the chi-square test (p-value) has been used to measure the statistical significance of any relationship in between three variables. There was a statistically significant relationship observed between knowledge and attitude, knowledge and practices, and attitude and practices about biomedical waste management as the $p < 0.05$.

Table 2: Summary of the goodness of fit of the models

Demographic Variables		Knowledge		Attitude		Practices		X^2 Results p value
		Good	Poor	Confident	Less Confident	Good	Poor	KAP
		194	106	140	160	196	104	
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Ages (Years)	20-28	121(62.37)	51(48.11)	92(57)	66(57)	125(64)	72(68)	$p < 0.05$
	29-37	48(24.74)	35(33.01)	53(33)	46(23)	49(25)	19(21)	
	38-46	19(9.7)	14(13.20)	9(5.5)	17(12.8)	22(11.8)	7(14)	
	47-55	4(2.0)	6(5.21)	4(2.5)	8(5.5)	(0)	4(9)	
	More	55	2(1.03)	(0)	2(0.7)	3(2.20)	(0)	2(4)
Gender	Male	109(56.18)	52(49.43)	78(48.5)	84(59.7)	83(42)	59(57)	$p < 0.05$
	Female	85(43.81)	54(50.57)	82(51.5)	56(40.3)	113(58)	45(43)	
Experience (Years)	1-7	122(64)	66(62)	119(63)	60(59)	113(58)	72(69)	$p < 0.05$
	8-15	36(19)	24(22.8)	34(18)	24(22.8)	49(25)	14(13)	
	16-23	25(12)	11(10.7)	25(12)	11(10.7)	26(13)	9(8)	
	More	24	11(6)	5(4.5)	11(6)	5(4.5)	8(4)	9(8)
Department	ICU	48(24)	26(24)	35(22)	36(26)	49(25)	22(21)	$p < 0.05$
	Medical	46(22)	24(22)	37(24)	33(23)	37(19)	25(24)	
	Radiology	27(14)	17(16)	32(20)	16(11)	25(13)	19(18)	
	Operation theater	50(26)	28(25)	44(28)	30(22)	59(30)	20(19)	
	Laboratory	25(13)	15(13)	12(8)	25(18)	26(13)	19(18)	
Occupation	Doctor	52(27)	27(26)	45(28)	36(26)	33(17)	42(41)	$p < 0.05$
	Paramedics	34(18)	13(12)	16(10)	31(22)	45(23)	17(16)	
	Nursing staff	98(33)	45(42)	62(39)	46(33)	81(41)	30(29)	
Medical Technologist		62(21)	21(20)	35(22)	27(19)	37(19)	15(14)	

DISCUSSION

The current cross-sectional descriptive research provided a one-of-a-kind opportunity to include statistics on KAP regarding Biomedical waste management which is becoming a cross cutting issue globally by many researchers (Nema et al., 2011). It will also be beneficial to recognize the vulnerabilities and actions that would be taken in the future to modify biomedical waste management at various levels in hospitals.

The aim of this study was to assess health care practitioners' expertise, attitudes, and activities about biomedical waste management who worked in private hospitals in twin cities of Pakistan. This study helped to evaluate their KAP in discussing the biomedical waste management. The result of the study demonstrates that amongst all the participants (64.7%) of the participants had good knowledge. A study conducted in tertiary care hospitals of Muzaffarabad, AJK, Pakistan their results exhibits that satisfactory knowledge score of health care professionals regarding hospital waste management were (60%) (Khan, Hamza, Zafar, Mehmod, & Mushtaq, 2017).In this study the results of association of socio-demographics with knowledge shows that the HCPs of age between 20-28 years had good knowledge, in case of gender males had good knowledge, however, the experience of HCPs of 1-7 years had good knowledge. Furthermore in the current study when socio-demographic (Occupation and department) was

associated with knowledge it was observed that the operation theater department had knowledge which was greater than the knowledge of laboratory department and the knowledge of the nurses were more in comparison to doctors.

Association of socio-demographic in correspondence with knowledge

The results of the present study also shows that there is a significant association of demographics with knowledge as $p < 0.05$.On the other hand similar study carried out in two major public-sector hospitals in Pakistan their results shows that knowledge score amongst nurses (90.9%) was meaningfully greater than doctors (72.2%) however male employees, on the other hand, were statistically marginally less likely to reach the mean score on information, and operation theater staff were 25 times more experienced than other staff. There was significant association found among Knowledge and socio-demographic variables (Kumar, Somrongthong, Ahmed, & Almarabheh, 2018).

Association of socio-demographic in correspondence with attitude

Findings of this study revealed that (53%) of the participants had confident attitude and (46.7%) were not confident towards their attitude. Similar study conducted in Northwest Ethiopia their results indicates that favourable attitude score of HCPs was (62.1%) (Deress et al., 2018).In our study the results of socio demographics with attitude reveals that the HCPs of age between 20-28 years had satisfactory attitude, in terms of gender toward attitude (51.5%) of females had satisfactory attitude. However, the HCPs of experience between 1-7 years had satisfactory attitude and in terms of department operation theater had confident attitude while in cases of occupation nursing staff had confident attitude regarding BMWM. The results of our study also indicates that there's a significant association found between demographics (Age, Gender, Experience, Department and Occupation) with attitude as their P < 0.05. A study conducted in Pakistan Their findings suggest that younger health care staff, males than females, and paramedics versus nurses became less likely to reach the average ranking on attitude regarding health care waste management. However, the results were also statistically insignificant ($p \leqslant 0.05$).It is also found that Doctors had positive attitudes towards Health care waste management in comparison to paramedics and nursing staff ($p = < 0.001$) (Kumar et al., 2018). Another similar study conducted in a Secondary Care Hospital of Al Buraimi Governorate, showed that the overall satisfactory attitude score was statistically insignificant ($p = 0.346$) (Yar et al., 2018).

Association of socio-demographics in correspondence with practices

The results of our study also revealed that (65%) of the participants had good practices about KAP regarding biomedical waste management. Similar study conducted in Northwest Ethiopia their results showed that the adequate practices score of the study participants was (78.9%), which is higher than (65%) score of our study (Deress et al., 2018). In our study the results of socio demographics with practices shows that the HCPs of age between 20-28 had good practices, in terms of gender towards practices females had desirable practices. However, the HCPs of experience between 1-7 years had good practices. In terms of department operation theater had good practices while in cases of occupation of HCPs nursing staff had good practices regarding BMWM. The results of our study also demonstrate that there is an important connection discovered between socio demographics with practices as $p < 0.05$. A similar research was carried out in tertiary care health centres. in Pakistan their results suggests that Practices of infectious waste management was found poor among all of the respondents, however it was found better in some extent among doctors and nurses but not up to the standard (Kumar, Samrongthong, & Shaikh, 2013). The results of our study resembled with the study conducted in Al Buraimi Governorate, Sultanate of Oman showed that the total satisfactory nurses practice score was greatly higher in comparison to doctors and other HCWs, It may be because of a lack of experience, a lack of participation, a lack of desire to participate in training activities, or patient overwhelm (Yar et al., 2018).

Moreover, another similar study conducted in Ajk Muzaffarabad, Pakistan their results reveals that the association between duration of work experience and KAP amongst different job categories of health

care professionals was not significant, except for association between work duration and practices of biomedical waste management amongst paramedical staff; majority of the staff 16% had work experience $\leqslant$ 16 years but their ordinary practices score was less than (60%) (Khan et al., 2017).

In our study another aspect waste handling time and infections spread because of mishandling of BMW was associated with KAP. In terms of waste handling time and spread of infections due to mishandling of BMW participants who respond on 12 hours of time and in cases of infections participants who respond on hepatitis C had good knowledge, attitude and practices regarding BMWM. In a study conducted in Sultanate of Oman their results suggests that Health care staff who correctly answered questions about diseases spread by inappropriate biomedical waste disposal, Hepatitis B, Hepatitis C, and Crimean-Congo hemorrhagic fever were found to be statistically relevant a p-value of 0.001. (0.004, 0.000 and 0.025 respectively) (Yar et al., 2018).

Knowledge association with attitude & practices & attitude with practices

In our study we also find the relationship between knowledge with attitude and also knowledge and attitude with practices. The results of our study showed that the association between knowledge with attitude and also knowledge and attitude with practices was found statistically significant $p < 0.05$. The results of same study performed in Sultanate of Oman their results revealed that the relationship between expertise and experience, as well as attitude and practice, was observed to be statistically negligible. Since it was discovered that total nurses' sufficient awareness, temperament, and activities ratings were greater than that of the other three grades, which could be attributed to their commitment, transparency, intense patient care, and a broader role in biomedical waste management allocated by hospital management (Yar et al., 2018).

Recommendations

Although the primarily focus of our study was on the Knowledge, attitude and practices regarding biomedical waste management amongst health care professionals of private sector hospitals in Pakistan it also attempted to examine how this impacted their awareness towards biomedical waste management. For effective and a successful disposal of biomedical waste management good biomedical waste management skills, mindset, and practices are needed.. This reveals that the majority of awareness programs and training sessions should highlight theoretical aspects of waste disposal with several lectures as well as effective practical training. We recommended that:

- There is a need of continuous education on biomedical waste management for all HCPs in a hospital environment.
- More research is needed to understand how to remove differences in KAP among various groups of HCWs and how HCWs with higher KAP can impact and support their colleagues, especially paramedics and housekeepers, to participate in optimal HCWM practices.
- Comprehensive awareness and advanced preparation programmes should be conducted at frequent intervals with all HCPs who are closely interested in the management of BMW, based on their level of awareness, in order to strengthen procedures.
- In the case of BMWM, the production and introduction of new rationalized national laws and guidelines should be considered. Furthermore, it is advised that focal individuals for BMWM be assigned roles and duties in order to better track the BMWM based on proper guidelines.
- Continuous supervision and monitoring mechanisms ought to be developed and implemented for effective treatment of BMWM in hospitals.
- Every health care professional should be vaccinated against Hepatitis B and other viral diseases.
- Screening tests should be free of cost for health care professionals and each health care professional should be hired after screening against all communicable diseases. PCR should be done for all those health care professionals who suffered from needle stick injuries while handling biomedical waste.
- A dedicated committee on HCWM should be formulated and regular meetings should be planned at facility level.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The current study also has some limitations that must be focused on be future studies. Data was collected only from private hospitals of just two cities. To generalize the results, data must be taken from other cities as well. Further Comparative research is required to understand the differences in KAP among health care professionals working in public and private sector hospitals.

CONCLUSION

Our study concluded that knowledge and practices scores of health care professional was more than half but the attitude of health care professionals was somehow low as compared to knowledge and practices. Nurses scored higher on education, temperament, and practices than other healthcare practitioners, which may be attributed to more intense patient treatment and participation in biomedical waste management. The results of this study clearly suggest that there is a need of continuous education and regular trainings on biomedical waste management for all health care professionals in a hospital environment. There was significant association found between demographics (ages, gender, experience, occupation and Department) and KAP regarding biomedical waste management. Also, there was significant association found between knowledge with attitude, Knowledge with practices and attitude with practices ($p < 0.05$).

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