

## Knowledge of Health Personnel on Different Categories of Medical Wastes in 7 Upazilla Health Complexes under Dhaka division in Bangladesh

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### Abstract

*This cross sectional study was conducted among Health personnel working in 7 Upazilla health complexes and support staff without medical background but concerned with waste management. A total of six respondents (Doctors, Nurses and Support Staff) from each of the above Upazillas were recruited for the study in those Upazilla health complexes with average bed occupancy >10/day and where >10 health personnel work. The present study investigated level of knowledge of personnel working in those upazilla health complexes concerned with the management of different categories of medical wastes. This study interviewed 42 respondents of which one third of each category was doctors, nurses, and support staff. Doctors provided significantly higher correct responses regarding infectious waste ( $p < 0.05$ ), pharmaceutical waste ( $p < 0.05$ ), Pathological waste ( $P < 0.05$ ), highly infectious waste ( $p < 0.05$ ). However, responses regarding chemical waste ( $p > 0.05$ ) and pressurized container waste were not significantly different among the three groups. Among the respondents all know about the potential dangers of HIV/AIDS, around 80% know about hepatitis, 71% know about cut injury and around 38% know about tetanus. In addition the distribution of the respondents regarding their response about high risk medical wastes, all the respondents reported about microbial waste as a high risk medical waste. Among other responses, stocks of highly infectious agents from laboratories, genotoxic/cytotoxic waste, radioactive waste and infected sharps were reported.*

**Key Words:** Medical wastes, hepatitis, HIV/AIDS

**Short title:** Different categories of medical waste in Upazilla Health Complexes

### Introduction:

The inappropriate management of medical waste causes serious environmental problems in terms of air, water and land pollution. The nature of pollutants can be classified as biological, chemical and radioactive. Environmental problems can arise from the mere

generation of medical waste and from the process of handling, treatment and disposal. In Tanzania, hospital waste was largely mismanaged in the past, mainly because the sector did not know what to do with the waste. The procedures for safe waste handling were not adhered to; for example, there were deficiencies in designation and identification of infectious waste, segregation, packaging and storage, as well as in transport procedures. Following countrywide training of incinerator operators and health officers in 2003, the management of hospital waste is now taking a new shape. However, treatment techniques for hospital waste are still poor. There are neither proper methods of treated waste disposal nor written contingency plans.

In this context, the first issue is to define what is meant by hospital waste. The terms 'hospital waste', 'medical waste', 'regulated medical waste', and 'infectious waste' remain poorly defined in the literature<sup>1</sup>. No standard, universally accepted definition for these terms exists, and many definitions are in use by practitioners and regulators. Given the diversity of interest and scientific credentials of persons, groups, and agencies (physicians, health departments, hospitals, environmentalists, trade unions, and state legislators) involved in the medical waste issue, these differences are expected. However, adoption of a definition by a regulatory agency has serious ramifications because it dictates all the terms.

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'Hospital waste' (or solid waste) refers to all waste, biological or non-biological, that is discarded and not intended for further use. 'Medical waste' refers to materials generated as a result of patient diagnosis, treatment, or immunization of human beings or animals.

'Infectious waste' refers to the portion of medical waste that can transmit an infectious disease<sup>2</sup>. Thus, 'medical waste' is a subset of 'hospital waste', and 'regulated medical waste', which is synonymous with 'infectious waste' from a regulatory perspective, is a subset of 'medical waste'. As stated, infectious waste is waste that is capable of producing an infectious disease; chances of this are higher within hospital than outside.<sup>3, 4, 5</sup> This definition requires consideration of the factors necessary for induction of disease, which include dose, host susceptibility, the presence of a pathogen, the virulence of a pathogen, and the most commonly absent factor, a portal of entry<sup>3</sup>. According to World Health Organization there are 10 categories of health care waste<sup>6</sup>. They are as follows: Infectious waste: infectious waste includes discarded materials or equipment, used for the diagnosis, treatment and prevention of disease that has been in contact with body fluids such as dressings, swabs, nappies, blood bag etc. This category also includes liquid waste such as faeces, urine, blood or sputum. Pathological and anatomical waste: pathological waste consists in organs, tissues, body parts or fluids such as blood. Amputated healthy body parts are also considered as infectious waste. Hazardous pharmaceutical waste: pharmaceutical waste includes expired, unused, spilt and contaminated pharmaceutical products, drugs and vaccines. Hazardous chemical waste: chemical waste consists of discarded chemicals that are generated during disinfecting procedures or cleaning processes. They may be toxic, corrosive or flammable waste with a high content of heavy metals: waste with high contents of heavy metals are cadmium, mercury etc. and their compounds pressurized containers: full or emptied containers or aerosol cans with pressurized liquids, gas or powdered materials. Sharps waste: sharps are items that can cause cuts or puncture wounds and needle stick injuries if they are infected they can spread infection. Highly infectious waste: highly infectious waste consists in microbial cultures and stocks of highly infectious agents from Medical Analysis Laboratories. Genotoxic/cytotoxic waste and radioactive waste: these are the radioactive or cytotoxic substances. Unmanaged hospital waste constitutes a hazard to the personnel because it contains toxic chemicals and pathogens ready to enter the human body through different routes of exposure<sup>4</sup>. Exposure to hazardous

substances contained in hospital waste include ingestion (swallowed material), inhalation (airborne chemicals and pathogens), and dermal absorption or through skin openings<sup>4, 5</sup>

Research and radio-immunoassay activities may generate small quantities of radioactive gas. The clinical application of <sup>85</sup>Kr and <sup>133</sup>Xe is the principal source of gaseous radioactive waste material requiring special disposal practices<sup>2,7</sup>. Gaseous radioactive material should be evacuated directly to the outside. For the workers' safety, such gaseous radioactive waste should not be mixed with the indoor air. If a special exhaust system is not available, an activated carbon trapping device may be used, which requires maintenance of the trap and monitoring of the off-gas; this, in turn, is a question of workers' exposure<sup>2, 7</sup>.

However, the volume of waste generated within large facilities and during immunization campaigns may be difficult to dispose of safely when resources are limited. In 2001, during measles mass immunization campaign in West Africa (covering all or part of six countries), 17 million children were vaccinated, resulting in the generation of nearly 300 metric tonnes of injection waste. Without adequate waste disposal options at both local and regional levels, this volume of waste would have been difficult to eliminate safely.<sup>8</sup>

In addition to the public health risks, if not managed, direct reuse of contaminated injection equipment results in occupational hazards to health workers, waste handlers and scavengers. Where waste is dumped into areas without restricted access, children may come into contact with contaminated waste and play with used needles and syringes. Epidemiological studies indicate that a person who experiences one needle stick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3% respectively of becoming infected with HBV, HCV and HIV.<sup>8</sup>

To better understand the problem of health-care waste management, WHO guidance recommends that countries conduct assessments prior to any decision as to which health-care waste-management methods be chosen. Tools are available to assist with the assessment and decision-making process so that appropriate policies lead to the choice of adapted technologies. In support of sound health-care waste management, WHO proposes to work in collaboration with countries through the following strategy?<sup>9</sup>

In this reality, the purpose of this study was to evaluate the knowledge of the health personnel and support staff on different categories of medical wastes in Upazilla health complexes in Bangladesh.

### Materials and Methods:

This was a cross-sectional study conducted at Sreepur, Kapasia, Kaligonj, Shivaloya, Satura, Savar & Dhamrai upazilla Health Complexes. The study populations were health personnel working in Upazilla Health Complexes and support staff without medical background but concerned with waste management. The data were collected from March 2009 to July 2009. Health personnels were selected purposively considering feasibility and convenience of the researcher. 6 (six) respondents concerned with waste management (doctors, nurses and support staff) from each of the above Upazillas were recruited (6X7=42). The inclusion Criteria of health care facility were:

The hospital provides health care that has the potential to generate medical wastes which include labor and OT facility, Diagnostic centre dealing with invasive blood and other investigation.

\*Upazilla health complexes with average bed occupancy >10/day

\*Having > 10 health personnel working

\*Willingness of the UHFPO to participate

And the inclusion Criteria of interviewee:

\*Health personnel working in the facility for more than 2 years

\*Nursing staff working in the field for more than 2 years

\*Support staff (ward boy or sweeper) working in the field for more than 2 years.

\*The persons not willing to participate were excluded from this study.

Data were collected by using a semi-structured questionnaire for interview and a checklist for facility assessment. In depth interview was conducted by the researcher at the selected health complexes with health personnel upon their consent and convenience. Pretested semi-structured questionnaire was used for interview of health personnel. A checklist prepared based on international best practice and WHO guideline assess the waste management of the health complex. Facility assessment was conducted by the researcher himself. Data collected by both questionnaire interview and checklist for facility assessment were sorted and coded. Then, the data were entered into the SPSS template. After necessary screening and cleaning data analysis was done. All the correct answers of the respondents regarding their knowledge about medical waste were marked as 1 and for non response and incorrect answers were marked as 0.

### Results :

In results, the distribution of the respondents by their knowledge about infectious waste (Table 1) shows that doctors knew better than nurses and support staff. The difference was found to be statistically significant ( $p < 0.05$ ). Distribution of the respondents about their knowledge on pathological waste by occupation (Table 2) indicates that doctors gave more correct answers than other two categories of staff. The difference was statistically significant ( $p < 0.01$ ). The distribution of the respondents about their knowledge on pharmacological waste by occupation (Table 3) shows that doctors were able to give more correct answers than other two categories of staff. The difference was statistically significant ( $p < 0.05$ ). The distribution of the respondents about their knowledge on chemical waste by occupation (Table 4) shows that more correct answers were made by the doctors than the nurses and support staff, however the difference was statistically insignificant ( $p > 0.05$ ). The distribution of the respondents by their knowledge about pressurized container waste (Table 5), the doctors were more knowledgeable than other two occupational categories. However, the difference was statistically insignificant ( $p > 0.05$ ). The distribution of the respondents by their response regarding hazard of infectious waste (Table 6), all the respondents correctly answered about transmission of respiratory and enteric infection. 41.2% reported about transmission of soft tissue infection and 23.5% respondents said about transmission of blood borne viruses. The distribution of the respondents by their response regarding hazards of sharp waste (Table 7), among the respondents all know about the potential dangers of HIV/AIDS. Around 80% know about hepatitis, 71.4% knows about cut injury and around 38% know about tetanus. In addition the distribution of the respondents regarding their response about high risk medical waste (Table 8), all the respondents reported about microbial waste as a high risk medical waste. Among other responses, stocks of highly infectious agents from Laboratories, Genotoxic/cytotoxic waste, radioactive waste and infected sharps were reported.

**Table 1: Knowledge about infectious waste by type of respondents**

Type of respondents	Correct answer		Incorrect answer		Total	
	F	%	f	%	f	%
Doctor	11	52.4	3	14.3	14	33.3
Nurse	7	33.3	7	33.3	14	33.3
Ward boy / sweeper	3	14.3	11	52.4	14	33.3
Total	21	100.0	21	100.0	42	100.0

Chi-Square = 9.14, df = 2, P = 0.01



**Table 2: Knowledge about pathological waste by type of respondents**

Type of respondents	Correct answer		Incorrect answer		Total	
	F	%	f	%	f	%
Doctor	10	71.4	4	28.6	14	33.3
Nurse	6	42.9	8	57.1	14	33.3
Ward boy / sweeper	2	14.3	12	85.7	14	33.3
Total	18	100.0	24	100.0	42	100.0

Chi-Square = 9.33, df = 2, P = 0.009

**Table 3: Knowledge about pharmacological waste by type of respondents**

Type of respondents	Correct answer		Incorrect answer		Total	
	F	%	f	%	f	%
Doctor	8	57.1	6	42.9	14	100.0
Nurse	6	42.9	8	57.1	14	100.0
Ward boy / sweeper	2	14.3	12	85.7	14	100.0
Total	16	38.1	26	61.9	42	100.0

Chi-Square = 6.09, df = 2, P = 0.047

**Table 4: Knowledge about chemical waste type of respondents**

Type of respondents	Correct answer		Incorrect answer		Total	
	F	%	f	%	f	%
Doctor	8	57.1	6	42.9	14	100.0
Nurse	6	42.9	8	57.1	14	100.0
Ward boy / sweeper	5	35.7	9	64.3	14	100.0
Total	19	45.2	23	54.8	42	100.0

Chi-Square = 1.35, df = 2, P = 0.52

**Table 5: Knowledge about pressurized container waste type of respondents**

Type of respondents	Correct answer		Incorrect answer		Total	
	F	%	f	%	f	%
Doctor	8	57.1	6	42.9	14	100.0
Nurse	5	35.7	9	64.3	14	100.0
Ward boy / sweeper	6	42.9	8	57.1	14	100.0
Total	19	45.2	23	54.8	42	100.0

Chi-Square = 1.35, df = 2, P = 0.51

**Table 6: Rank order of the response of the respondents regarding knowledge about hazard of infectious waste (n=17)**

*Knowledge about hazards of medical waste	Frequency	Percentage	Rank
Transmission of respiratory infections	17	100.0	1
Transmission of enteric infections	17	100.0	1
Transmission of soft tissue infections	7	41.2	2
Transmission of bloodborne viruses	4	23.5	3

\*Multiple responses

**Table 7: Rank order of the response of the respondents regarding knowledge about hazard of sharp waste (n=21)**

*Knowledge about Hazard of medical waste	Frequency	Percentage	Rank
HIV/AIDS	21	100.0	1
Hepatitis	17	81.0	2
Cut injury	15	71.4	3
Penetrating injury	11	52.4	4
Tetanus	8	38.1	5
Skin infection	4	19.0	6

\*Multiple responses

**Table 8: Response regarding high risk medical waste (n=22)**

*Response regarding high risk medical waste	Frequency	Percentage
Microbial cultures	22	100.0
Stocks of highly infectious agents fom Laboratories	14	63.6
Genotoxic/cytotoxic waste and Radioactive waste	8	36.4
Infected sharps	3	13.6

\*Multiple responses

**Discussion :**

Awareness among the health personnel and the staff associated with healthcare waste management is essential to minimize their risk and also to save the environment and general people from the hazards of medical wastes. Not many researches were conducted in Bangladesh to assess the scenario of health care waste management and people's understanding about the issue. The present study investigated level of knowledge of personnel working in 7 upazilla health complexes concerned with the management of different categories of medical wastes.

Doctors could give significantly higher correct responses regarding infectious waste (p < 0.05), pharmaceutical waste (p < 0.05), pathological waste (p < 0.05), highly infectious waste (p < 0.05). However, responses regarding chemical waste (p > 0.05) and pressurized container waste were not significantly different among the three groups. Among the respondents all know about the potential dangers of HIV/AIDS, around 80% know about hepatitis, 71.4% know about cut injury and around 38% know about tetanus. In addition the distribution of the respondents regarding their response about high risk medical waste and all the respondents reported about microbial waste as a high risk medical waste. Among other responses, stocks of highly infectious agents in Laboratories, Genotoxic/cytotoxic waste, radioactive waste and infected sharps were reported.

The diseases which are transmitted by hospital wastes are alarming in Bangladesh. There is evidence of hepatitis B infection among 10 per cent of children and 30 per cent in adults. About 5 per cent of the total population of Bangladesh is thought to suffer from chronic hepatitis B infection. Although cases of HIV/AIDS are low in Bangladesh in comparison to neighbouring countries, nevertheless the numbers are rising.<sup>1</sup>

It may be noted here that much of the clinical wastes like, syringes, needles, saline drips, discarded foods, gauze, vials, and ampoules are collected by women and children who re-sell them despite of deadly health risks. It is estimated that hospital wastes account for a very small fraction, notably, only about 1 per cent of the total solid wastes generated in Bangladesh. In a report from the World Bank, only 10-25 per cent of the hospital wastes are infectious or hazardous. The amount of such hazardous wastes is quite small in figure and until recently this was not handled properly. Mixing with the domestic solid wastes, the total waste stream becomes potentially hazardous.<sup>10, 11</sup> particularly the sharp wastes are of great concern.

Available literature suggests that some steps should be taken for minimisation of hospital waste. According to best practice, before any clear improvement can be made in medical waste management, consistent and scientifically based definitions must be established as to what is meant by medical waste and its components, and what the goals are. Plans and policies should be laid down for this purpose. Then the waste should be segregated. Imposing segregated practices within hospitals to separate biological and chemical hazardous wastes will result in a clean solid waste stream, which can be recycled easily. If proper segregation is achieved through training, clear standards, and tough enforcement, then resources can be turned to the management of the small portion of the waste stream needing special treatment. New emphasis should be put on the reduction of waste, workers' safety should be ensured through education, training and proper personal protective equipment.

The lack of manpower and lack of awareness among the managers regarding hospital wastes and their management were identified by the study as major factors for hindrance in the sector.

### Conclusion :

Potential hazards identified in the study from improper waste management of infectious waste are transmission of enteric infections, transmission of tissue infections and transmission of bloodborne viruses. Potential hazards identified in the study from sharp wastes are transmission of HIV/AIDS, transmission of hepatitis B, cut injury, penetrating injury, tetanus and skin infections.

The high risk medical wastes identified by the study participants are microbial cultures, stocks of highly infectious agents, genotoxic or cytotoxic wastes and radioactive wastes and infected sharp wastes. In general, doctors were more knowledgeable about medical wastes and their hazards than nurses and support staff, as

expected. However, the knowledge doesn't seem to differ much between nurses and support staff. About different medical wastes, respondents know better about hazards of sharp waste and liquid waste. Regarding level of knowledge about hazards of Medical wastes, respondents know better about hazards of sharp waste, and infectious, About pathological and high risk medical wastes, the knowledge level was very poor. Awareness regarding different types of hospital wastes among health managers were low. Initiative should be made to raise their knowledge level and awareness regarding the issue. Further study should be conducted on the issue with larger sample size and greater logistic support to reveal more generalized picture of country situation.

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