J Nepal Health Res Counc 2010 Apr;8(16):23-6

Healthcare Liquid Waste Management

Sharma DR,[1] Pradhan B,[2] Pathak RP,[2] Shrestha SC

[1]Department of Public Health, Yeti Health Science Academy, Kathmandu,Nepal [2]Department of Community Medicine and Family Health, Institute of Medicine, Tribhuvan University, Kathmandu, Nepal [3]Department of Public Health, Asian College of Health Sciences, Kathmandu, Nepal.

ABSTRACT

Background: The management of healthcare liquid waste is an overlooked problem in Nepal with stern repercussions in terms of damaging the environment and affecting the health of people. This study was carried out to explore the healthcare liquid waste management practices in Kathmandu based central hospitals of Nepal.

Methods: A descriptive prospective study was conducted in 10 central hospitals of Kathmandu during the period of May to December 2008. Primary data were collected through interview, observation and microbiology laboratory works and secondary data were collected by records review. For microbiological laboratory works,waste water specimens cultured for the enumeration of total viable counts using standard protocols.

Results: Evidence of waste management guidelines and committees for the management of healthcare liquid wastes could not be found in any of the studied hospitals. Similarly, total viable counts heavily exceeded the standard heterotrophic plate count ($p=0.000$) with no significant difference in such counts in hospitals with and without treatment plants ($p=0.232$).

Conclusions: Healthcare liquid waste management practice was not found to be satisfactory. Installation of effluent treatment plants and the development of standards for environmental indicators with effective monitoring, evaluation and strict control via relevant legal frameworks were realized.

Key words: healthcare, liquid waste management, microbiology, plate count, waste management

INTRODUCTION

Healthcare waste generated from public and private hospitals are in increasing trend in Nepal. Liquid wastes are generated in hospitals from different departments such as operation theatres, clinical laboratories, radiology and other sources.[1] The basic principle underlying wastewater management is the strict limit on the discharge of hazardous liquids into sewers without prior treatment.[2]

The sewerage facility in the towns of Kathmandu valley is provided to 15% of the houses only.[3,4] The remaining sewage is directly released into rivers turning the latter into open sewers. In addition, four out of five municipal wastewater treatment plants are non-functional in Kathmandu.[4] Therefore, sewage, which also incorporates healthcare liquid waste, is adding more risks to the communities, which are already in burden with various kinds of infectious diseases. In such scenario, this study was carried out to explore existing healthcare liquid waste management practices in Kathmandu based central hospitals of Nepal.

METHODS

A descriptive study conducted in Kathmandu based central hospitals (seven government designated central hospitals and three teaching hospitals viz. Tribhuvan University Teaching Hospital, Nepal Medical College

Correspondence: Mr. Dhundi Raj Sharma, Department of Public Health, Yeti Health Science Academy, GPO Box: 21860, Kathmandu, Nepal. Email: dsharmadr@hotmail.com, Phone: 9851085137.

Teaching Hospital, Kathmandu Medical College Teaching Hospital) during the period of May to December 2008. The samples were collected by convenient sampling method. Ethical approval and participant consents were taken. Information related to liquid healthcare waste management practice was collected by semi-structured interview with nursing directors and/or administrative officers by applying closed and open ended questionnaires. Healthcare liquid waste management practice was observed and recorded using observation checklist, for which, housekeeping supervisors' help was obtained. Secondary data were obtained from record review. For microbiological study, 150 ml of triplicate hospital effluent water specimens from all hospitals were collected at 10.00 am from the outermost chambers before their drainage into the sewerage system. Each specimen was brought to the laboratory within one hour of collection. All the samples were subjected to total viable count studies by spread plate method in nutrient agar medium, for which, 100 µl of 10^{-4} to 10^{-6} dilution prepared in sterile normal saline were spread onto nutrient agar plate and incubated for 24 hours at 37^{0}C. The plates showing 50-150 colony counts were used for expressing the total viable counts of bacteria. All data regarding bacterial isolates were recorded in the laboratory checklists. All the media and antibiotic discs were obtained from Hi-Media. Statistical Package for Social Sciences (SPSS) 13.0 version computer software was used for data entry and analysis. Student's t test for independent means and one sample t test were performed to compare the means of bacterial counts.

RESULTS

None of the hospitals could show the evidence of healthcare liquid waste management (HCLWM) guidelines and committees and only one of them had organized trainings for their workforces involved in healthcare liquid waste management (Table 1).

Table 1. Distribution of hospitals by healthcare liquid waste management

Variables	Frequency (%)		Total
	Yes	No	
A. HCLWM* guideline	0 (0)	10 (100)	10 (100)
B. HCLWM committee	0 (0)	10 (100)	10 (100)
C. Training on HCLWM	1 (10)	9 (90)	10 (100)

HCLWM*= healthcare liquid waste management

Respondents of all hospitals were also asked on how the healthcare liquid waste management practice could be improved. All of them were positive on the preparation and implementation of HCLWM guidelines. More than half of the respondents said that government should have initiated the plans for safe management of healthcare liquid waste with legal enforcement.

Table 2. Distribution of hospitals by HCLWM practice

Variables	Frequency (%)		Total
	Yes	No	
A. Presence of treatment plant	2 (20)	8 (80)	10 (100)
B. Quality assurance of liquid waste treatment process	-	10 (100)	10 (100)
C. Disposal into sewerage system	5 (50)	5 (50)	10 (100)

Only 2 hospitals had treatment plants for HCLWM (Table 2). However, none of them had written guidelines on HCLWM and quality assurance of the liquid waste treatment process in these plants. Similarly, 5 hospitals disposed their liquid wastes into sewerage system and the remaining disposed their liquid wastes into nearby surface water, mainly rivers.

Table 3. Total viable bacterial count of hospital effluent specimens

Waste water specimen codes	Mean of total viable bacterial count ± Standard deviation (x 106 cfu/ml)
Hospital effluent specimens	
H1	34.0±17.0
H2	12.3± 8.0
H3	29.0± 18.0
H4	40.7±11.0
H5	56.0± 17.0
H6	51.0± 7.0
H7	44.7±13.0
H8	32.7± 14.0
H9	15.3±12.0
H10	48.0±12.0

When asked on the reasons for not installing liquid waste treatment plants, three fourth of the respondents did not feel any requirement for having such plants. The nursing directors and administrative officers further said that the hospital management should have been aware of the problems if the plants were really essential. They demanded that trainings were necessary for those

staffs who were involved in healthcare liquid waste management.

For the enumeration of total viable counts, the specimens were coded as H1 to H10 and the plates showing 50-150 colony counts were used for expressing the total viable counts of bacteria (Table 3).

All the total counts enumerated in hospital effluent specimens significantly exceeded the standard heterotrophic plate count of 10^4 cfu/ ml (p=0.000), the emission standards of liquid waste for discharging into river water. However the total viable counts in hospitals with and without treatment plants were not found to be significantly different (p=0.232) while compared by t test for independent means.

DISCUSSION

None of the hospitals of this study had evidence of healthcare liquid waste management (HCLWM) guidelines and committees for the management of such wastes. It should be noted that 7 out of 10 hospitals included in this study were central hospitals of the government of Nepal. One can easily presume the situations in profit making healthcare institutions since the establishment of treatment plants is rather expensive to establish and maintain. Qualitative findings on the requirement and establishment of waste water treatment plants suggest that the health professionals should be educated on the control of potential health hazards of untreated infectious wastes.

All the total counts enumerated in hospital effluent specimens heavily exceeded the standard heterotrophic plate count of 10^4 cfu/ ml[5]. Similarly, the hospitals having treatment plants were not showing less number of viable bacteria as compared to other hospitals lacking them, which suggest the possibility of non-functioning status of these plants. These findings imply that pathogenic organisms might also have been present in waste water and public health would be at stake unless these were treated either in the hospital or waste water treatment plants of the sewerage system. This study found that only 5 hospitals, neither of which had treatment plants, were discharging their liquid wastes into sewerage system and the rest, into nearby surface water (rivers/ streams). Since, four out of five municipal waste water treatment plants (WWTPs) of Kathmandu valley are non-functioning, infectious wastes are being discharged untreated.[4] The ineffectively treated or untreated hospital effluents have further worsened the problems of getting pathogenic organisms in surface water resulting into water related public health hazards.

It is very notable that some hospitals which receive patients with highly communicable diseases like cholera, jaundice and typhoid directly discharge their waste water including vomits, urine and faeces into surface water of nearby river. Even though the source tracking studies of infectious disease agents are not documented in Nepal, such practices could be attributed to the seasonal outbreaks of some water borne communicable diseases in urban areas.

There have been six years since the relevant authorities rightly identified needs for institutional and legislative activities in order to improve healthcare waste management in Nepal.[6] However, identifying gaps and formulating policies alone will have very little effects unless these are legally enforced and efficiently implemented. In the least developed countries like Nepal, where there is not enough connection to municipal sewage networks, discharge of untreated waste water to the environment can inevitably pose major health risks.[3,7] Therefore, national legislation is the basis for improving health-care waste management practices in the country. It establishes legal controls and permits the national agency responsible for the disposal of health-care waste and to apply pressure for their implementation.[8] Hence legislation and monitoring of relevant indicators after implementing policies in healthcare waste management are extremely essential. Only then, all the healthcare facilities and related institutions will follow national guidelines and implement for the better management of health care wastes. Qualitative findings related to the improvement of healthcare liquid waste management in different hospitals of this study suggest the same.

National health care waste management guideline developed by Nepal Health Research Council and WHO, in 2002, requires further work with clear vision on the management of liquid waste generated in healthcare institutions.[9] Though it has clearly identified the legislation, policy and strategy shortcomings in waste management, monitoring of the effectiveness of HCLWM system through a comprehensive lists of indicators for compliance, and impact monitoring has been left for concerned ministries to follow. The document is almost silent in adopting different treatment options for large quantities of waste water generated in hospital settings. Learning from the lessons of non-functioning municipal WWTPs, cost effective and easy to maintain technologies for small to large volumes of waste water treatment options could have been discussed in the guidelines.

Healthcare liquid waste might have been overlooked as it flows down the rivers and the exact sources cannot be traced. As of now it could not be a big concern either

for policy makers, or for hospital management and people residing around these areas. However, this study indicates that healthcare liquid waste management should be a national issue as untreated infectious waste affects, directly or indirectly, all people in a much larger area. Therefore, the problems of healthcare liquid wastes generated in healthcare institutions should be immediately addressed by relevant authorities through policy formation, guidelines development and legal enforcement to protect the communities from adverse health impacts.

CONCLUSIONS

Healthcare liquid waste management practice was not found to be satisfactory. Installation of effluent treatment plants and the development of standards for environmental indicators with effective monitoring, evaluation and strict control via relevant legal frameworks were realized

ACKNOWLEDGEMENTS

We wish to thank Mr. Han Heijnen for the financial support from World Health Organization (WHO) to carry out this research. We also thank the respondents for their support in information collection, and the department of community medicine and family health for providing its laboratory facility.

REFERENCES

1. Nepal Health Research Council. Healthcare waste management training manual for medical professionals. [Online]. 2008 [Cited 2008 July 10]; Available from: URL: http://www.nhrc.org.np/guidelines/health_care_wate_management.pdf
2. World Health Organization. Healthcare waste management manual. [Online]. 2008 [Cited 2008 July 8]; Available from: URL: http://www.who.int/topics/medical_waste/en/
3. National Planning Commission, Government of Nepal/ United Nations Development Programe. Millennium development goals needs assessment for Nepal: managing water supply and sanitation. [Online]. 2006 [Cited 2008 Nov 30]; Available from: URL: http://www.undp.org.np/publication/html/mdg_NAN/MDG_NeedsAssessmentNepal.pdf
4. International Center for Integrated Mountain Development/ Ministry of Environment, Science and Technology/ United Nations Environment Program. Kathmandu valley environment outlook. [Online]. 2006 [Cited 2008 Nov 30]; Available from: URL: http://books.icimod.org/demo/uploads/ftp/KVEO-Full-text.pdf
5. Kavka G, Berger B, Hoch BM, Herndl G. Assessment of microbiological water quality in the Austrian section of the River Danube. Arch Hydrobiol. 1996:1(113 Suppl 4):79-86.
6. Ministry of Health. Healthcare waste management in Nepal: Assessment of present state and establishment of a framework strategy and action plan for improvement. [Online]. 2003 [Cited 2008 Nov 30]; Available from: URL: http://www.moh.gov.np/new/HCWM%20Nepal%2005.03.04.pdf
7. Pruess A, Giroult E, Rushbrook P. Collection and disposal of wastewater. [Online]. 2008 [Cited 2008 Dec 28]; Available from: URL: http://www.healthcarewaste.org/
8. World Health Organization. Legislative, regulatory and policy aspects. [Online]. 2008 [Cited 2008 Nov 30]; Available from: URL: http://www.who.int/water_sanitation_health/medicalwaste/001.pdf
9. Nepal Health Research Council. National health care waste management guidelines. [Online]. 2002 [Cited 2008 Nov 30]; Available from: URL: http://www.nhrc.org.np/guidelines/National%20Health%20Care%20Waste%20Management%20Guidelines.pdf