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Health Care Waste Management Practice in Health Care Institutions of Nepal

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ABSTRACT

Background: Medical waste is considered as a major public health hazard. In a developing country like Nepal, there is much concern about the management practice of medical waste. This study aimed to assess Health Care Waste Management practice among Health Care Institutions in Nepal.

Methods: A cross sectional study was carried out between July 2012 to June 2013 in 62 different Health Care Institutions, selected from stratified proportionate random sampling technique from all administrative regions of Nepal. A structured questionnaire and observation checklist were used for data collection.

Results: The waste generation rate is found significantly correlated with bed capacity, patient flow rate and annual budget spent in the hospital. It is found significantly higher in Teaching hospital than other Health Care Institutions of Nepal. An average of 3.3 kg/day/patient of medical waste (2.0 kg/day/patient non-hazardous and 1.0 kg/day/patient hazardous waste) was generated during the study period. Further, it was found that most of the Health care wastes were not disinfected before transportation to waste disposal sites. Very limited number of Health Care Institutions had conducted Environmental Assessment. Similarly, some of the Health Care Institutions had not followed Health care waste management guideline 2009 of Nepal Government.

Conclusions: We found poor compliance of medical waste management practice as per existing legislation of Government of Nepal. Hence, additional effort is needed for improvement of Health care waste management practice at Health Care Institutions of Nepal.

Keywords: Hazardous waste; legislation; medical waste management; Nepal; non-hazardous waste; occupational health.

INTRODUCTION

Health care waste (HCW) has been considered as a special category of waste because of its potential environmental and health risks.[1] It may contain highly toxic or infectious substance and can play a significant role in disease transmission.[2-6] Health care waste management (HCWM) practice vary among Health Care Institutions (HCIs) and problems can arise in all HCIs in each stage of waste management process.[7] Most of the information available about HCWM practice in Nepal is limited to Kathmandu Valley.[8] This work was carried out to estimate the amount of non-hazardous and hazardous waste generated from different HCIs, to explore HCWM systems (handling, segregation, collection, transport, storage, treatment and disposal) as well as to find out whether hospitals comply with the National Guidelines and Standards about HCWM or not. Hence, this study aimed to assess HCWMpractice among HCIsin Nepal.

METHODS

A cross sectional study was conducted in different HCIs of Nepal having bed capacity above 25. Here, all types of hospitals having bed capacity above 25 were defined as HCI. According to 2011 Ministry of Health and Population data, there are 184 HCIs with bed capacities above 25 in Nepal.[9] Among them, 62 (34%) HCIs were included in the study. Stratified proportionate random sampling technique was adopted to select the hospitals. The hospitals were stratified into four strata, private (33); government (12); community and mission (9) teaching and autonomous (8). Then, HCIs were selected from each strata through random sampling technique representing five administrative development regions of Nepal.

A standard structured interview questionnaire was used

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to collect information about HCWM. This data collection tool was developed by using references from waste management guidelines of World Health Organization, Department of Health Service, and Nepal Health Research Council (NHRC).[10,11] Interview was taken with hospital management head, medical superintendent or with an assigned representative from the hospital waste management team. Waste generation rate was also verified after observation of waste collection unit in the HCLs. Data collection period was from July 2012 to June 2013.

To ensure validity and reliability, the structured interview questionnaire was pretested on 10% sample from the sampled HCIs and consistency and rigor was maintained by cross-checking. Tools were translated into Nepali and back-translated to English to ensure that tools were understandable to the participants. Daily collected information was checked for identifying its completeness and consistency. Data coding and recoding was done before data entry. Data were entered into Epi data and they were manually cleaned. Data analysis was done using Microsoft Excel and SPSS version 16. Ethical approval was taken from the Ethical Review Board of NHRC and consent was obtained from the respective hospital administrations.

RESULTS

In the study, more than 62% of the HCIs were located in the Central development region followed by Western, Eastern, Midwestern and Far-western regions (Table 1). Majority of the selected HCIs were private hospitals (53.22%, n=33) followed by government hospitals, community and mission hospitals, and teaching and autonomous health care institutions (Table 2).

Table 1. Health care institutions by region and zone.

S.N	Region	Zones	Selected HCLs
1	Central	Bagmati, Janakpur, Narayani	39(62.9%)
2	Western	Dhaulagiri, Gandaki, Lumbini	10(16.13%)
3	Eastern	Koshi, Mechi	8(12.9%)
4	Midwestern	Bheri	3(4.84%)
5	Far-western	Seti, Mahakali	2(3.22%)
Total			62(100%)

Table 2. Types of Health care institutions selected.

S.N	Type of hospital	Total hospitals (>25 beds)	Selected HCIs
1	Private hospitals	109	33(53.22%)
2	Government hospitals	42	12(19.35%)
3	Community and Mission hospitals	19	9(14.52%)
4	Teaching and Autonomous HCLs	26	8(12.90%)
	Total	184	62(100%)

Average bed capacity in teaching and autonomous HCLs was the highest of all HCIs averaging more than 600 beds per institute followed by government hospitals, community and mission hospitals and private hospitals . We found a significant difference in bed capacity between various types of HCIs ($p<0.01$). Further, it is found that the amount of waste generated was associated ($p<0.01$) in each case with the capacity of bed in the hospital.

It was found that average number of patients in the Fiscal Year 2012/2013 in teaching and autonomous HCIs was around four times greater than that of the government hospitals and 9 times higher than the community hospital and 13 times higher than the private hospitals.

Table 3. Estimation of medical waste generation based on waste categories.

Health Care Waste	Waste (kg/day/patient)
Non-hazardous waste	
Degradable waste	1.6
Recyclable waste	0.41
Hazardous waste	
Infectious waste	0.47
Pharmaceutical waste	0.20
Sharps	0.18
Chemical wastes	0.10
Radioactive waste	0.02

The budget allocations for the fiscal year 2013 varied in different HCIs. Teaching and autonomous HCIs had the highest budget allocations of all the HCIs (Figure 2). The budget allocation was found statistically significant, both between the groups ($p < 0.01$) and within the

groups (p< 0.01). On average, HCIs had allocated less than 5% of their budgets in medical waste management. It was found that 40% of the HCIs had spent 1-5% and 18% of the HCIs had spent less than 1% of their total budget on HCWM. Furthermore, 2% HCIs claimed that they were spending more than 20% of their total annual budget for HCWM whereas budget allocation from remaining 29% HCIs could not be assessed.

The average waste generation in HCIs was 3.0 kg/day/patient (non-hazardous waste = 2.0 kg/day/patient and hazardous waste = 1.0 kg/day/patient). Among non-hazardous waste, 1.6 kg/day/patient was degradable waste and 0.41 kg/day/patient recyclable waste. Hazardous waste consisted of 0.47 kg infectious, 0.20 kg pharmaceutical, 0.18 kg sharps, 0.10 kg chemical and 0.02kg radioactive waste per day per patient (Table 4). Further, it was found that, teaching and autonomous HCIs had very high waste generation rate which was about eight times greater than that of government hospitals and about thirteen times greater than that of the community and private hospitals.

The difference in mean waste generation rate between different types of and autonomous HCIs was found statistically significant (p<0.01) at 95% confidence level. Waste generation rate varied significantly with bed capacity, inpatient and outpatient flow rate, and annual budget spending of the hospital (p<0.01).

In this study, around 59 (95%) hospitals were found to separate HCW according to HCWM guidelines 2009 of Government of Nepal. Trolleys were used only in 13(20.96%) HCLs and in remaining 49(79.03%) HCLs, waste was carried by hand from waste generation wards to waste collection places. About 60% HCIs had an autoclave designated for sharp and hazardous waste disinfection before waste transportation from collection to disposal site.

It was found that 60(96.8%) hospitals used plastics, 9(14.5%) hospitals used metallic containers, 3(4.8%) hospitals used cardboard and 2(3.2%) hospitals used bags for temporary storage of HCW within the premises of hospital. Furthermore, around 27(43.5%) HCIs transported waste via municipal services, 24(38.7%) transported it to the disposing sites themselves, 9(14.5%) to private company and remaining 2(3.2%) HCIs used other methods for waste transportation. In addition, 17(27.42%) HCIs had practiced disinfection before transportation and 7(11.29%) partly disinfected waste before transportation whereas in majority of the HCIs (n=38, 61.29%), disinfection was not done before transportation. It was also reported that both temporary and permanent waste storage systems were employed. More than 85% of HCIs used temporary storage system.

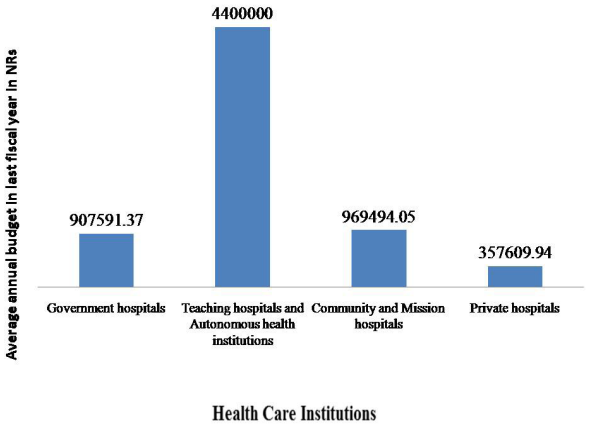

Figure1. Distribution of Annual mean budget (1$=100 NRs).

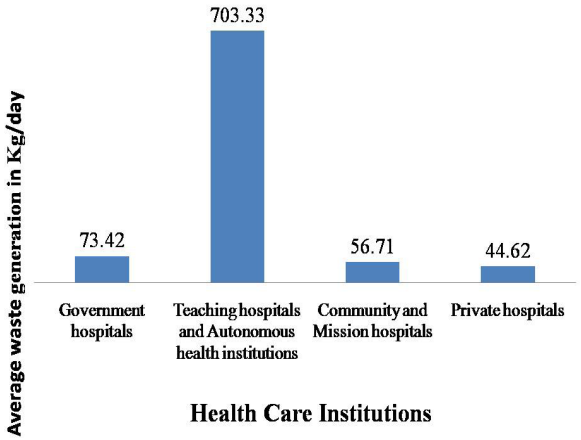

Figure 2. Average waste generation in HCIs

Regarding disposal of HCW, most HCLs had directly delivered their medical waste to municipal vehicles for disposal, and few hospitals used contractors. Besides this, 19 (30.64%) HCIs reported using an incinerator for disposal of waste. Around 51 (82.26%) hospitals started their health care waste disposing process only after 24 hours of its collection, 6(9.68%) within 24 hours, and 5 (8.06%) did not have any specific schedule. Regarding waste water treatment system, there was no waste water treatment facilities in 74.12% (46) HCIs. There was no significant difference in waste disposal procedures among various categories of hospitals (p>0.05).

Further, 31(50%) HCIs had not disinfected liquid waste before disposing, 7(11.29%) partly disinfected whereas

only 17(27.42%) practiced disinfection before disposal to drainage.

It was found that, 18(29.03%) HCIs had prepared an environmental assessment report (Environmental Impact Assessment(EIA) and/or Initial Environmental Examination(/EE) report). Around 15(24.19%) HCIs had formulated a waste management committee and 74.19%(n=46) HCIs had prepared HCWM plan. Moreover, about 28(45.16%) HCIs had followed a self-developed protocol, 22(35.48%) followed the HCWM guidelines 2009, 3(4.83%) hospitals had followed national HCWM guidelines and 10 (16.13%) had not followed any guidelines.

About 60% of the HCWM workers had received vaccinations from their HCIs, and 98% of waste handlers had received training before working in HCWM. During observation, personal protective equipment, such as aprons, containers, plastic bags, masks, gloves; boots were found in most of the HCIs.

DISCUSSION

In order to protect the environment and public health, there is an urgent need to control and manage HCW generated from all level of HCIs. In the current study, average bed capacity in teaching and autonomous health care institutions was higher compared to government, community and mission hospitals, and private hospitals. The amount of waste generated was associated to bed capacity and annual budget of hospital ($p<0.01$). The variables such as bed capacity and annual budget also reflect patient's occupancy in the hospital. Previous study has shown that there is an association between bed capacity and waste generation rate at hospitals.[4] Teaching and autonomous HCLs are established for academic purpose and for providing health care services. Therefore, annual budget of it is higher than that of other HCIs. The budget allocation for management of waste varied in different HCIs. Sufficient budget allocations play a vital role in HCWM and maintenance of a healthy environment on hospital premises. Out of total annual budget, it was found that all the HCIs had not spent more than five percent budget in waste management. Besides this, quantity and categories of waste generation from HCIs play an important role during the management of waste. Generation of non-hazardous waste was nearly two times higher than that of the hazardous waste from HCIs of Nepal. HCW generation (both non-hazardous and hazardous) in Nepal was found lower than other developing countries,[12] including Bangladesh and China[13] whereas it was found higher than North Jordan.[14] HCW generation in teaching hospitals was about eight times greater than government hospitals and about thirteen times greater than community and private institutions. It was found that few hospitals stored waste for more than 24 hours within the hospital premises. This practice is not environmentally sound and can lead to contamination. Therefore, temporary storage of the waste must be well sanitized and secured.[15] As per WHO and Government of Nepal guidelines, hazardous HCW should be disinfected by autoclave within hospital premises before transportation. However, in the present study autoclave was present only in 60% hospitals. It was found that most of the hospitals had sent waste to municipalities and private sector contractors without disinfection. The HCW collection, storing, disinfection, transportation and disposal mechanisms is found better and proper in China than Nepal as per WHO prescription in China.[16] Legally, the practice of mixing of HCW to municipality waste without disinfection has been prohibited.[17-19] However, the practice appears to be widespread due to weaknesses in translation of leigislation into action.

A very limited number of HCIs had on-site facilities for waste disposal. In the current study, it was found that 30.64% HCIs were using an incinerator for disposal of waste. Further, it was found that, incinerators were not maintained as per the standard guideline. According to different studies, incineration is not an environment friendly procedure and hazardous for human health which can lead to emission of highly toxic gases such as furans and dioxin causing chronic cancer as well as acute toxicity in humans.[16,20] Nevertheless, hospitals in many countries have relied on this practice until now.[10, 12, 20] Very limited number of HCIs had prepared an EIA/IEE report. As per the Environmental Protection Act 2054 (1997), HCIs should comply to schedule I and schedule II before establishment of HCIs. Each HCI must be responsible for providing a safe and healthy workplace, and provide appropriate information about risk of hazardous waste by conducting training and education manual. Previous studies have shown that Physicians and dentists are five to ten times more likely to experience hepatitis B infection than the general adult population.[21,22] Almost all HCIs had reported that training was provided to housekeeping person before joining to household waste management work. There is probability of occupational health hazard if there is no proper use of occupational safety.

This research has reflected situation of waste generation and waste management practice in HCIs having bed capacity of above 25 in Nepal. However, this information

May not be applicable for generalization and management practice in HCIs having beds capacity below 25.

CONCLUSIONS

We found an average HCW generation rate of 3 kg/person/day/patient in the present study. Waste generation was significantly correlated with bed capacity, patient flow rate and annual budget spent in the hospital. Further, the compliance of medical waste management practice was not in accordance with the guidelines and standards of Nepal in most of the HCIs. Hence, additional effort is needed for improvement of Health Care Waste Management practice at HCIs of Nepal.

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