

## SILENT KILLING THROUGH EXPOSURE TO HEALTHCARE WASTE UNDER THE CURRENT MANAGEMENT PRACTICES IN CHITTAGONG

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**Abstract** – Chittagong city has two popular names such as commercial capital and healthy city of Bangladesh for locating near sea beach and surrounded by many small or medium scale hills. But due to unplanned urbanization and high population pressure, the municipal solid waste (MSW) generation quantity is rising up including healthcare waste (HCW). HCW is a part of the entire MSW but it is very important for containing little quantity of hazardous waste. Its contribution to MSW streams ranging from (1-1.2) % only. But improper or partial management of HCW is responsible to converting the entire MSW to hazardous nature. With a view to estimating HCW impact on exposures in Chittagong city, we directed this study from June, 2012 to June, 2013. It reveals that the entire HCW generation rate of Chittagong city is 18 tons/day including all categories of sources (MSW is 1161-1500 tons/day). It was also found that nurses and HCW handlers suffer from various diseases by spreading germs from waste such as HIV/AIDS, Hepatitis, Skin disease/allergy, infection, diarrhoea, fever, headache, cough, asthma, typhoid and needle stick accident. Though nurses are little aware about the harmful effect of HCW but workers or ayas have nothing. For sharp and hazardous HCW every healthcare entity (HCEs) has bucket type incinerator and cutter. But they don't use them rather make open fire to burn either behind premises or dumping sites ultimate result of which is CO<sub>2</sub> emission. Unfortunately, syringe and saline bag (which contains more germs) are collected and sold at price BDT 40-50/kg for recycling without any pre-treatment. At source HCWs are handled by workers without wearing any protective gears even transported mixing with MSW in open truck. For lack of proper technology and monitoring HCWs are normally recycled with MSW without considering long term effect. Though Department of Environment (DoE) has already introduced a guideline manual but there is no sign of any enforcement.

**Key words:** Healthy city, Healthcare waste, Disease, Syringe, Saline bag, Recycling and Disposal.

### 1.0 INTRODUCTION

Chittagong is the second largest city in Bangladesh and area is 61 square miles and population size is about 5 millions. It is adorned with many natural resources and beauties which are gifted by God himself which together have formed Chittagong as a healthy city [22]. Currently there are 11 city corporations in Bangladesh which indicates the continuous expansion of urban areas but helpful to create new employment opportunity and therefore more people are diverting to urban areas for seeking jobs ultimate result of which is large quantity of HCW generation [23]. In case of first world countries, they are very conscious about the harmful impact of HCW and so properly manage. Further there are many strict rules and regulations which are followed by them too. Besides being enriched in fund and technology, they can easily treat and incinerate hazardous HCW [19]. Most of the European countries have decentralized hospital

incinerators, because of high operation costs and pollution problems widely banned and replaced by pre-treatment technologies at the source [16]. In contrary, third world countries or underdeveloped countries, they are lag behind in case of technology due to poverty. So they can't properly manage their generated HCW safely rather misuse [5]. Threat from needle stick accidents is very common and risky. In case of China HCW management and treatment is one of the national priority tasks and applied technologies and management practices are the segregation of medical waste streams at the source to reduce the 'critical waste disposal' to hazardous materials. Non-hazardous MW can be managed and treated analogue to MSW [16]. Hospitals produce a tremendous amount of HCW that is defined as any solid waste which is generated as a result of patient diagnosis, treatment, or immunization of humans or animals, in related research, and the waste capable of producing infectious disease and may pose a variety of health

risks [2; 18]. In Bangladesh, there is insufficient awareness of the magnitude of the HCWs issue by concerned individuals at different levels from director or divisional head to tokai (waste pickers). One study showed that the hospital staffs including high officials, and waste “haulers” were not aware of the safe disposal and handling of hospital waste. Nevertheless the chemicals used for the staining and preservation of slides and for the sterilization and cleaning of equipment and surroundings are potentially harmful to the laboratory technician and the environment [1]. An estimate shows that some 5.2 million people (including 4 million children) die each year from waste-related diseases all over the world. A large quantity of HCW generate everyday where 75-90% are no-hazardous and can be handled easily as it is less dangerous to public health and is easily recyclable. But the little fraction (10-25%) of the waste generated by health-care facilities (HCFs) is infectious and risky to manage [21]. Medical experts say the dumping of HCW in open places not only pollutes environment but also helps spread diseases like jaundice, TB, Tetanus, Cholera and even AIDS [15]. The HCW management is one of the major environmental concerns, which may significantly increase the exposure of infectious pollutants [9]. HCW in particular has increased greatly because hospitals use relatively more disposable items, such as syringes, cutlery, food trays, bed pans, etc. [13]. According to WHO, the waste produced by hospitals carries a higher potential for infection and injury than any other kind of waste [8; 17]. HCW is considered dangerous because it may possess pathogenic agents and can cause undesirable effects on human health and the environment [6]. In many places in Dhaka city around private and public hospitals and diagnostic centers hospital staff are often found selling used needles, syringes, ampoules, blood bags and a variety of other materials. The waste materials are washed in an unhygienic condition for selling those to vendors. But the authorities pay no attention to it. Very few HCFs maintain scientific waste management facility. The HCFs functioning in various parts of the country hardly possess any scientific waste disposal device [15]. It is because the municipal institutions do not have sufficient resources and capacity to collect the HCW because the entire HCW generation quantity per day is very large [6]. All over the country, the HCW management practices have not being given due attention and the waste disposal in our hospitals is placed at a low priority which possess a risk for patients and healthcare personnel, who handle these wastes [10]. Besides unsafe injection practices and reuse of needles and syringes are harmful. In contrary, safe practices are also found such as use of gloves, gowns, disinfectant and needle cutter but hardly found. There are many dealers who collect and sell

syringes and saline bags to recycling industry without any treatment.

This study reveals that in Chittagong city, awareness about HCW impact is very negligible among exposures. In the same way, providing training to nurses and workers is very poor too. Ultimate result of which is improper or partial management of HCW. Due to poverty and lack of proper knowledge mismanagement of HCW is a very common scenario in Chittagong city. As example we can see recycling of hazardous HCW without making any treatment which is very risky and harmful for health and environment.

## **2.0 MATERIALS AND METHODS**

### **2.1 Study area location**

Chittagong city is known as healthy city but its HCW management practice is not satisfactory at all. Therefore we selected the entire Chittagong City as study area which is located on the bank of the Bay of Bengal and on the Right Bank of the river Karnafuli and lies within 22°-14' and 22°-24'-30'' N Latitude and between 91°-46' and 91°-53' E Longitude.

### **2.2 Reconnaissance field survey**

For the purpose of practical observation we arranged a few empirical field visits within the study area and which helped us to realize the actual scenarios of current HCW exposures facing problems. Based on gathered experiences from reconnaissance survey, we continued further study.

### **2.3 Questionnaire survey**

We prepared a semi-structured questionnaire and brought a few changes during survey to include any new issue arising. We conducted survey of some selected HCEs exposures. They always tried to avoid such type of issues which go against them or not following at all. Then we asked some indirect questions and found out our desired answers.

### **2.4 Interview with contacted persons**

Due to some constrictions for conducting any lab based test of HCW, we planned to select some doctors, nurses, staffs, patients and workers to know about their experiences and knowledge. According to plan, we interviewed some exposures and collected data regarding to what types of HCW are responsible for what sort of disease spreading and who are suffers. In addition we tried to know about their knowledge about harmful impact of HCW and how try to overcome these problems.

## 2.5 Mapping

We collected GPS locations of different category of HCEs in Chittagong by using Garmin GPS Tracker. We covered more than three-fourth of the total numbers of HCEs in Chittagong city. Then we compiled them into MS Excel Sheet and plotted into GPS visualize software and got our desired maps.

## 2.6 Data analysis

Finally we compiled all of our questionnaire survey and reconnaissance survey data into MS Excel sheet and rearranged for obtaining desired results. Then we analyzed the data by using MS Excel software.

## 3.0 RESULTS AND DISCUSSION

### 3.1 Introduction of Chittagong City



Figure 3.1: Chittagong City Corporation Area map

Chittagong City is not only the principal city of the district of Chittagong but also the second largest city of Bangladesh. Besides it is known as both healthy city and the commercial city of Bangladesh (figure 3.1). Historians have given various explanations as to the origin of the name Chittagong. Bernoli (1786) explains that the name Chittagong came from the Arabic word Shat (delta) prefixed to Ganga (Ganges), indicating the city at the mouth of the Ganges. The district received the name 'Chittagong' from the city. In addition, Chittagong is very different in terms of topography, with the exception of Sylhet and northern Dinajpur, from the rest of Bangladesh, being a part of the hilly regions. The height of the hills loses in town and breaks up into small hillocks scattered all over

the town. Chandranath or Sitakunda is the highest peak in the district, with an altitude of 1152 feet above mean sea level. Nangarkhana to the north of Chittagong town is 289 feet high. In the town itself, there is a peak known as Batali Hill, which used to be 280 feet high and was the highest point in the town. There was a light post at the top of Batali Hill for the guidance of vessels far away in the sea. This famous hill, like other beautiful hills and hillocks in the city of Chittagong, is being gradually levelled up and reduced in height for the construction of houses [22].

### 3.2 Current MSW and HCW generation scenarios of Chittagong city

Due to rapid migration and urban area expansion, the total number of city dwellers is increasing day by day. As a result the quantity of MSW generation is rising up and in the same context; HCW contribution from different category of HCEs is noticeable. But the area of Chittagong city is around 61 square miles and population size 5 millions [22]. Therefore its total MSW generation is around 1161.113 tons per day [7]. But collection efficiency is almost 42%. Per capita waste generation is 0.48 kg/day. From total generated waste, major portion is food and vegetable (67%) [20]. In contrary the whole HCW generation of the city is 18 tons/day (comparing to MSW 1.2% only) [11]. On an average the contributors of HCW from different category of HCEs varies such hospitals, dental clinics, diabetic hospitals, clinics, maternities and eye hospitals, respectively with mean HCW quantities of 440, 115, 90, 75.75 and 56.86 kg/day. But maternities are generating significantly higher quantity of HCW per patient handled (6.63 kg/day) followed by almost similar contributors - eye hospital (4.48 kg/day) and general clinics (4.47 kg/day). In contrary, large general hospitals were better in controlling the waste per patient to as low as 2.12 kg/patient/day [12] and hazardous HCW is 22% [3].

### 3.3 Existing HCW management scenarios of Chittagong city

A few years ago, there was no authority or initiative who solely managed HCW. Therefore at the very early all types of HCWs were managed mixing with MSW by municipal ultimate result of which is the conversion of the entire MSW management program as a daunting task. But from 2011 a private initiative named Innovation Sheva Sangstha (ISS) has started their program concerning to HCW management [4]. They collect

HCW only from contracted HCEs (60) by charging BDT 2000-5000/month based on size and running programs including waste generation quantity. They use covered van to collect and transport HCW from source to dumping site. They have totally 10 manpower and workers hardly wear any protective gears. Nevertheless they do most of the process as same as municipal except using covered van and burial plant which is not properly running at present. They cover only one-fifth of the entire generated HCW of Chittagong city and the major or rest portion is managed by municipal authority mixing with MSW.

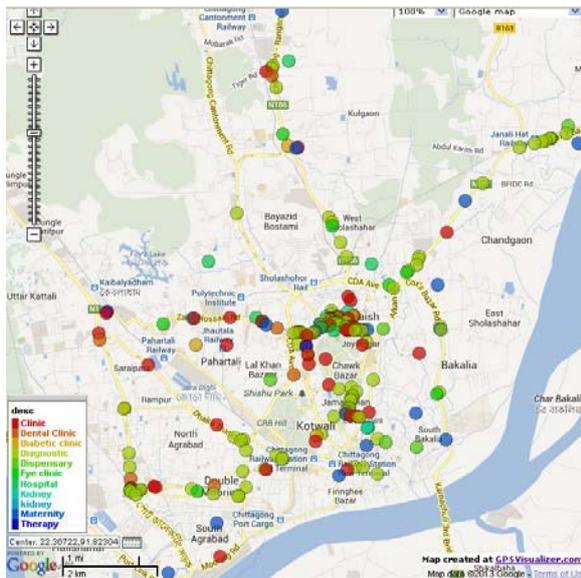


Figure 3.2: Different category of HCEs distribution map of CCC

From figure 3.2 it is stark clear that all the HCEs are not clustered in the same zone but it is true that majority of them are found in three zones such as KB Fazlul Kader Road, Panchlaish Residential Area and Jamal Khan. Then comparatively low density zones are OR Nizam Road, Zakir Hossain Road, Agrabad Access Road, Boropool, Hatazari Road and Muhra. Therefore it is not very tough work to collect and manage the entire generated HCW in Chittagong city safely and properly.

### 3.4 Exposures awareness about HCW impact on their health and environment

For the purpose of safe and secured management of HCW, awareness regarding to HCW impact among exposures and mass people is urgent. Otherwise it will fail to reach the desired goal and to save associated people from dangerous effect. We interviewed a few doctors, nurse, staffs, patients and workers of different category of HCEs in Chittagong city. The respondents replied that doctors and nurse are trained 42% and 38%

respectively while staffs, patients and workers are 12%, 3% and 3% (figure 3.3) on average 100. But the nurses don't follow the rules properly.

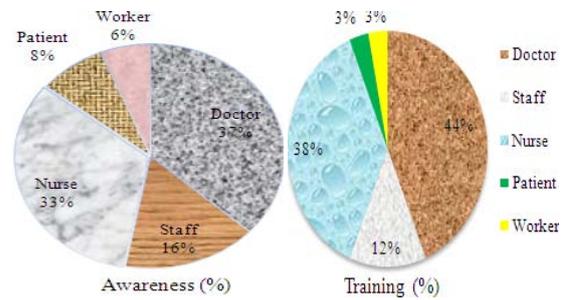


Figure 3.3: Percentage of awareness about HCW among exposures

But in case of staffs, patients and workers have no training about HCW management. In contrary, doctors, nurses, staffs, patients and workers are aware about HCW impact 37%, 33%, 16%, 8% and 6% respectively. In case of patients only few have such types of knowledge who are higher educated. But another study was conducted in Chittagong Medical College Hospital (CMCH) among 100 (sixty eight male and thirty two female) respondents where 62% of health care workers do not aware of hazards of HCW. Only 38% are aware of infectious HCW. Among them only 12% learned about the hazards of HCW from hospital authority. Rest of them is aware of this implication from personal information. All of the health care workers claimed that they have no training on HCW handling safely. Even they do not take any protective measure. 66% of the health care workers of different service type were punctured at least once or several times [14].

### 3.5 Disease spread among exposures

Since HCW contains a little portion of hazardous waste ranging from 18-22% which are responsible to transmit germs of diseases. In this case HCW acts as a carrier of germs. There are various infectious HCW which carries germs and causes diseases such as blood born pathogens, laboratory wastes, pathological wastes, isolation wastes and liquid infectious wastes. Besides other minor infectious HCW are any body fluids with visible blood, amniotic fluid, cerebrospinal fluid, pericardial fluid, peritoneal fluid, pleural fluid, saliva in dental procedures, semen/vaginal secretions, synovial fluid and anywhere body fluids are indistinguishable (figure 3.4). This study reveals that the most common disease which is affected by nurses, patients and workers are HIV/AIDS, Hepatitis A, Hepatitis B, Hepatitis C, skin disease/allergy, infection, diarrhoea, fever, headache, cough, asthma, typhoid, viral diseases, tuberculosis, diphtheria, cholera, needle stick accident and many others.



Figure 3.4: Scenarios of how germs are spread from different types of HCW to exposures

Exposures are affected by these diseases when they handle infectious HCW. This problem is occurred when such type of wastes are contaminated by an organism that is pathogenic to healthy humans, the organism is not routinely available in the environment; the organism is in significant quantity and virulence to transmit disease. Thus such type of HCW may enhance environmental pollution and the spread of infectious diseases. The concern is heightened by the newly emerging and reemerging pathogens and for increased drug resistance among the re-emerging pathogens. Proper management of healthcare wastes can prevent cross infection, nosocomial infection, and the spread of epidemics of infectious diseases. Unfortunately, this aspect is completely ignored in Bangladesh.

### 3.6 Recycling and harmful usage of HCW

Plastic or metal types of HCW current market value is very high (figure 3.5). Therefore the poor people who depend on collecting and selling scraps goods, they try to earn more money quickly. Hence they collect and sell such type of HCW to scrap or vhangary shop. Since huge quantity of such type of waste generate from HCFs But they have no knowledge about the harmful or negative impact of recycling HCW mixing with MSW in the long run on our health and environment. As a result, they don't care to treat them only washing by normal water. Therefore they continue such type of illegal practice considering their economic benefits not

environmental or social. They can sell such type of HCW at BDT 40-50/kg price (BDT 55000/ton). Unfortunately none of collector or recycler treats them rather they only wash which are not capable to kill or destroy containing germs.



Figure 3.5: The most commonly recycled HCW types in Chittagong but through unhealthy way

But due to lack of proper knowledge and awareness, this heinous practice is extending day by day. Most of the high level officials and concerning persons are aware about this harmful activity but they don't wish to pay attention in this issue rather some of them are directly engaged with their illegal business.

### 3.7 HCW collection and transportation



Figure 3.6: HCW collection and transportation scenarios of Chittagong city

Only a few years ago, HCW collection and transportation system were very cruel in Chittagong city corporation (CCC). But with the passage of time such type of scenario is altering gradually. Recently ISS has started a better HCW collection and transportation program but it should be extended to cover major portion of the generated HCW in CCC. Nevertheless, sometimes it is found that workers are wearing protective equipments

which are poor in quality. They deny wearing these protective equipments. ISS use covered van to transport HCW but CCC use open trucks hardly tarpawl covering.

### 3.8 HCW disposal in Chittagong city

The final stage of HCW management process is disposal. It is very important but risky too. There are three commonly used disposal options available in CCC such as open burning, land filling and burial. But all of these options are done in hazardous way and responsible for creating human health hazard and environment pollution which are shown in (figure 3.7). All of them open burning and open land filling are prime.



Figure 3.7: HCW disposal scenarios of CCC by different organizations

### 3.9 Comparative discussion

If we think a few years before, then it was common scenario of HCW management that none would think about its effect or didn't follow any rules and regulations concerning to HCW (ISO or WHO). But at that time, Bangladesh government didn't make any separate rules about HCW management both in Environmental Policy 1992 and Act 1995. But in 2008 a separate HCW management guideline manual has been formed by DoE. It is a matter of great regret that it is hardly found to practice this manual.

### 4.0 CONCLUSION

Chittagong city is known as healthy city in Bangladesh. But if we consider in case of HCW management it goes completely against this concept. HCW generation from different category of sources vary from one to another depending on its size or running programs or serving number of patients. But it is a very tough work to handle such ever increasing quantity of HCW by using limited resources and technology. Nevertheless awareness about HCW impact is very negligible and training rare too. Due to lack of proper knowledge and poverty, it is a common trend of collecting and selling saline bags and syringes to scrap/vhangary shops for the purpose of recycling without making any pre-treatment. They also do same process in case of such other recyclable HCW.

### 5. ACKNOWLEDGEMENT

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Symbol	Meaning
AIDS	Acquired immune deficiency syndrome
HIV	Human immune virus
BDT	Bangladesh Taka
CCC	Chittagong City Corporation
CMCH	Chittagong Medical College Hospital
DoE	Department of Environment
GPS	Geographical Positioning System
HCE	Healthcare Entity
HCF	Healthcare facilities
HCW	Healthcare Waste
ISS	Innovation Sheva Sangstha
MSW	Municipal Solid Waste

## 7. NOMENCLAUTRE