

## *International Journal of Scientific Research and Reviews*

### **Assessment of Biomedical Waste in Govt. Hospitals of Cuttack City**

**Dr. Dharendra Kumar Sarangi<sup>1</sup>, Puspapalata Pal<sup>2</sup>**

<sup>1</sup> Ex-Principal and Head, Deptt. Of Zoology, J.K.B.K. Govt College, Cuttack.

<sup>\*2</sup> Assistant Professor, Department of Zoology, Ravenshaw Jr. College, Cuttack.

#### **ABSTRACT**

Bio medical waste generated from five govt hospitals and two blood banks of Cuttack city was studied by field visits during June 2012 to May 2013. Assessment study was done at five govt run hospitals and two blood banks having total 2,110 beds such as (1) SCB Medical College & Hospital, (2) Sardar Vallabhai P.G Institute of Paediatrics, (3) Cuttack District City Hospital, (4) Acharya Harihar Cancer Research Centre, (5) Anti T.B. Demonstration & Training Centre, (6) Central Red Cross Blood Bank and, (7) SCB Medical College Blood Bank.

Data were collected with the assistance of (i) Field visit for personal observations to assess waste generation, collection, handling, segregation, transportation, treatment and disposal practices (ii) assessment of volume of toxic and nontoxic wastes (iii) assessment of knowledge, attitude, temperament and motive towards safe, scientific management practices of working nursing & para medical staff, house keeping personnel, waste handlers and BMW management personnel with the help of pre-structured questionnaires, interviews and discussions. The result from the assessment studies indicated –(i) inappropriate collection, improper segregation and transportation, unscientific treatment and unsystematic disposal practices (ii) absence of introduction of modern technological management options like advanced incinerator, microwave & autoclave in all the hospitals (iii) absence of dedicated institutional facilities for the treatment and disposal of solid and liquid wastes (iv) Lack of substantial knowledge, training, motivation, will and accountability even among qualified hospital staff (v) unauthorised and illegal reuse of contaminated disposables and other infected solid waste. The study also found that the major treatment method used for infectious waste at SCB Medical College Hospital was a old model incinerator which was not functioning properly while all other hospitals lacked that facility. Non-infectious waste was disposed off in land filling. Almost all the hospitals and blood banks did not follow standard management practice and disposed off both infectious and non-infectious waste without having proper policy and plan. Therefore, proper implementation of biomedical waste management policy in these hospitals is the need of the hour to maintain the existing deficiency and requirements of biomedical waste management.

**KEYWORDS :** *Cuttack City, Biomedical waste, landfill, incinerator*

#### **\*Corresponding author**

Assistant Professor, Department of Zoology,

Ravenshaw Jr. College, Cuttack

*Email: puspapal97@gmail.com*

## INTRODUCTION

Hospitals are usually generated large volume of Biomedical waste which is not only infectious but also hazardous as it transmits diseases among the patients and health care personnel causing harm to life and environment. It is the duty and responsibility of the hospitals to provide clean and effective health care services to the patients ensuring healthy environment. So proper management of these hospital wastes have emerged as a major challenge as it may lead to spread of dangerous diseases like T.B, hepatitis, enteric fever, bronchitis, gastroenteritis, skin and eye diseases carrying infection and injury than any other type of wastes. But proper management of these wastes can considerably reduce health risk and environment concerns.

Scientific management of biomedical waste through segregation, collection and treatment using tools & technology in an environmentally sound manner minimises the adverse impact on health workers and on the eco system. The hospitals and health care facilities are expected to put in place the mechanisms for effective disposal either directly or through common biomedical waste treatment facilities. The main purpose of waste management is to maintain hospital hygiene & clean up the surrounding environment by adopting appropriate methods for waste neutralization and elimination of health risks to humans. The safety of health care workers and communities in the vicinity is most important. There are various issues, concerns and challenges to the Authorities for proper implementation of biomedical waste management at ground level.

### *1.Generation of Bio-medical Waste*

The waste generated from hospitals, clinics, diagnostic centres, blood banks, research facilities, laboratories and other healthcare centres is called Biomedical wastes. Both infectious, non-infectious, non-infectious-hazardous and non-infectious and non-hazardous wastes generated from these centres. Approximately the quantity of biomedical waste generated in India is estimated to be 1-2 kg per bed per day in hospitals and 600 gm per day/bed in a clinic according to economic and social condition of the location of the health care centres. Nearly 85% of the hospital waste is non-hazardous, 15% is infectious and hazardous. Mixing of hazardous waste with non-infectious or non-hazardous waste with general waste results into contamination and makes the entire waste hazardous. So segregation and treatment is vital before disposal of such wastes. Though a small portion of these waste is toxic but it is harmful both to the hospital staff, patients and the public. The impact of mismanagement of biomedical wastes cause air, water and land pollution which has serious implication on life and environment. According to the World Health Organisation study in 1996 which indicated that more than 50,000 people die every day from infectious diseases

in the world. The most important cause for the increase in infectious diseases around the world is the improper waste management .

## **2. Definition of Biomedical Waste :**

According to the Biomedical waste (Management & Handling )Rules 1998 of Govt of India “Biomedical Waste means any waste which is generated during the diagnosis,treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or testing of biological,including categories mentioned in Schedule-1 appended to these rules “ . It is ascertained from the definition that Biomedical waste comprises human & animal anatomical waste, treatment apparatus like needles, syringes and other materials used in health care facilities in the process of treatment and research. These waste are generated during diagnosis, treatment or immunisation in hospitals, nursing homes, pathological laboratories, blood bank, etc.

## **3. Biomedical Wastes and its classification**

**3.1. Infectious hazardous Wastes:** Biomedical waste refers to the waste that are produced from hospitals,healthcarecentres , research laboratories ,nursing homes,clinics and diagnostic centres. Generally 85% of hospital wastes are non -infectious and non-hazardous where as 10% are infectious non-hazardous while the remaining 5% are both infectiousand hazardous.**3** Wastes generated from health carecentres include sharps, non-sharps, blood, body parts, pharmaceuticals, medical instruments , used syringes, soiled bandages, used chemicals ,house keepingequipments, radioactive materials and other related wastes generated from hospital services.**4**.Therefore these wastes need special treatment before final disposal as its management has become a major concern for administration for its direct impact on human health and environment.

**3.2. Non-infectious non-hazardousWastes** : Approximately 85% wastes generatedfrom hospitals and other health care centres are non-hazardous . These include wastes constituting leftover food , fruit peels, paper made cartoons, glasses, packaging materials, wash water etc.**2**

Both the infectious and non-infectious waste are categorised according to their types and its treatment and disposal options are shown in Table-2

## **4. Present status of Biomedical waste managementof Cuttack city**

As per World Health Organization report approximately 15% biomedical waste is infectious out of which 10% is hazardous while remaining 5% is highly hazardous. At present, most of the biomedical waste generated from the city is being disposed off along with municipal waste.

The untreated liquid waste from the hospitals and health care centres flows into the open drainage linked to Taladanda canal and Kathajodi river. The present biomedical waste management practices in the city are unscientific, improper and unlawful. Segregation and storage of waste of infectious and non-infectious waste at the point of generation is grossly neglected. Though the govt hospitals have assigned the task of biomedical waste management to some authorised private agencies but negligence on their part is noticed in Cuttack City. Most private hospitals, nursing homes, clinics and other health care services centre keep on throwing the waste on the streets, footpaths, drains, river and canal sides. Even infectious wastes generated from operation theatres, wards, laboratories and diagnostic centres are disposed off without any disinfection. Large number of hospitals, nursing homes, health care centres has been identified by the Authority in Cuttack but do not take any initiatives for the safe and scientific disposal of the biomedical wastes. The biomedical wastes get mixed up with the municipal waste and transported to the common disposal point located at Brajabiharipur which is just a few kilometres away from the City.

The present scenario at all the studied five government hospitals and two blood banks of Cuttack city revealed that approximately (5,84,189/kg/year) and (758.5gm/bed per day) wastes generated from 2,110 beds but no segregation at the point of generation was noticed despite installation of different colour coded containers. It was observed that the mixed infectious and non-infectious wastes were collected from the colour containers in one storage bag in a hand driven trolleys and transported to the intermediate open site without enclosure and sanitation of the premises of the hospital towards treatment or final disposal. No recommended treatment and disposal technologies like incinerator, autoclave, microwave, hydroclave, shredder etc are used properly. Even protective clothing, gloves, mask and apron etc for personnel who handled wastes were not noticed during study. No proper training was imparted regarding handling and management of medical wastes, infection control and protection against biomedical hazards for injury and infection like hepatitis B, C, AIDS, Typhoid and Nosocomial diseases. In all the studied hospitals and blood banks, the infectious and non-infectious wastes were mixed and collected in a single container despite separate colour containers were kept in each ward of the hospital's storage site for waste segregation. Even these untreated toxic and hazardous wastes mixed with other general municipal wastes are transported for land filling by open tractor poses environmental threat and public health risk and equally harmful to the personnel involved in the activities. It was also revealed from the study that saline bottles, disposable syringes, i.v fluid bottles and used bottles without any disinfection are back to the market either through recycling or reuse which may spread deadly and infectious diseases.

## 5.Steps of Biomedical Waste Management :

Different steps of Biomedical Waste Management processes like – waste identification at point of generation followed by segregation or separation ,disinfection ,treatment ,precaution for both internal storage and external storage , handling , transportation and final disposal have been outlined for effective management of Biomedical Waste in any organisation **5**. The most important part of waste management is categorization of different kinds of wastes and put them into colour coded containers at the point of generation as per Schedule II of Biomedical Waste (management and handling) Rules 1998, Govt of India which is shown in Table-1.

**Table- 1-Colour coding, treatment options and type of containers/bins used for disposal of biomedical waste as per BMW management and handling rules – 1998(Schedule-II) and as amended .**

Colour coding	Type of containers to be used	Waste category numbers	Treatment options as per schedule I
Yellow	Non-chlorinated plastic bags/puncture proof container	1,2,5,6	Incineration
Red	Non-chlorinated plastic bags/puncture proof containers for sharps	Category 3,4,7(4-waste sharps) In the earlier Rules,soiled waste)	As per Schedule I(Rule 7)
Blue	Non-chlorinated plastic bags container	Category 8(chemical waste)	As per Schedule I(Rule 7)
Black	Non-chlorinated plastic bags	Municipal waste	Disposal in municipal dump sites

The waste should be collected from containers by trained waste management personnel and it should be packed in leak proof bags after disinfection . The waste handlers must have acquired training ,necessary equipments, protective uniform, gloves, boots and masks for their safety. The waste should be loaded and transported with utmost care by the help of dedicated wheeled trolleys, carts or containers painted biohazard symbol on every side .The vehicle should be disinfected or sanitized after every use .

**Table 2 – Categories of Biomedical waste, its treatment and disposal options as per BMW(management and handling)-Rules -1998 and as amended.**

Waste Category	Waste Category Type	Treatment & Disposal options
Category No.1	<b>Human Anatomical Waste</b> (body parts,organs,human tissues).	Incineration
Category No.2	<b>Animal Waste:</b> (Animal tissues,organs,bodytissues,organs,bodyparts,carcasses,bleedingparts,fluid,blood and experimental animals used in research,waste generated by veterinary hospitals/colleges,discharge from hospitals,animal houses).	Incineration
Category No.3	<b>Microbiology &amp; Biotechnology Waste and other Laboratory waste</b> (Wastes from clinical samples,pathology,biochemistry,haematology,bloodbank, laboratorycultures,stocks or specimens of microorganisms live or attenuated vaccines,human and animal cell culture used in research and infectious agents from research and industrial laboratories,wastes from production of biological,toxins,dishes and devices used for transfer of cultures).	Disinfection at source by chemical treatment or by autoclaving /microwaving followed by mutilation shredding and after treatment final disposal in secured landfill or disposal of recyclable wastes(plastics or glass) through registered or authorized recyclers
Category No.4	<b>Waste Sharps</b> (needles, glass syringes or syringes with fixed needles ,scalpels,blades glass etc. that may cause puncture and cuts.This includes both used and unused sharps).	Disposal in secured landfill or incineration
Category No.5	<b>Discarded Medicines &amp; Cytotoxic drugs</b> (Waste comprising of outdated ,contaminated and discarded medicines).	Disposal in secured landfill or incineration
Category No.6	<b>Soiled waste</b> :Items contaminated with blood and body fluids including cotton,dressings,soiled plaster casts,linen,beddings,other material contaminated with blood	Incineration
Category No.7	<b>Infectious solid waste</b> :Wastes generated from disposable items other than the waste sharps such as tubings,hand gloves ,saline bottles with IV tubes ,catheters,glass ,intravenous sets etc.	Disinfection by chemical treatment or Autoclaving or Microwaving followed by mutilation or shredding and after treatment final disposal through registered or authorized recyclers
Category No.8	<b>Chemical Waste</b> (Chemicals used in production of biologicals,chemicals used in disinfection , as insecticides, etc.).	Chemical treatment and discharge into drains meeting the norms notified under these rules and solids disposal in secured landfill.

The final treatment of biomedical waste can be executed with the help of modern technological equipments like incineration ,autoclave , hydro clave or microwave <sup>6</sup>. The used plastic and glass intravenous bowls, infections sets, sharp syringes and needles should be shredded in a hand mill or an electric shredder before being handed over to the agency for disposal. The disposal methods of different categories of biomedical waste as per BMW (management and handling)-Rules-1998 and as amended are shown in Table -2.

## **MAERIALS ANDF METHODS**

### **1. Field Study Area :**

The area under biomedical waste management survey is Cuttack City which is the former capital of Odisha and the current headquarters of Cuttack district. The city is popularly known as the Health Hub of eastern India where there are many specialized Government Hospitals along with large number of private hospitals ,nursing homes, pathology clinics, dental clinics , diagnostics centres ,pharmaceuticals and surgical stores. Spread across an area of 298 sq km, the city of Cuttack is situated at the apex of the Mahanadi River Delta and is located about 28 km north of Bhubaneswar,the capital of Odisha.The city has a population of 606.007 individuals as of the 2011 India census. The transportation facilities in the city are good.

### **2.Field study of hospitals and blood banks :**

Field visits to the five govt hospitals and two blood banks was done in order to assess the types of facilities available in the hospitals and blood banks . Secondly,the purpose of the field study was to acknowledge and experience the present waste management practices and disposal methods adopted by the each hospital.The personal observation study was conducted at : (1) SCB Medical College & Hospital,(2) SardarVallabhai P.G Institute of Paediatrics,(3) Cuttack District City Hospital,(4) AcharyaHarihar Cancer Centre, (5)Anti T.B. Demonstration & Training Centre,(6) SCB Medical College Blood Bank, and (7)Central Red Cross Blood Bank. The survey was conducted to gather information personally and make an assessment on quantity of waste generation ,segregation, storage ,treatment ,transportation and present disposal practices.

### **3.Geographical details & climate of Cuttack district :**

Cuttack is located at 20 degree 30'N 85 degree 50' E/ 20.5 degree N 85.83 degree E and an average elevation of 36 meters (118 ft) .Located at the apex of the Mahanadi delta the city is surrounded by the river and its tributaries in almost all sides. These include the Kathajori,theKuakhai and the Birupa. Cuttack experiences tropical wet and dry climate.



**Table – 3 - Facilities and beds available in all the five surveyed Govt. Hospitals and two blood banks**

Sl. No	Name of Hospitals & Blood Banks	Beds available	Facilities available in all the hospitals and blood banks
1.	SCB Medical College & Hospital	1310	Anatomy, Physiology, Biochemistry, Biochemistry, Comm. Medicine, Pathology, Microbiology, Pharmacology, F.M.T., Radiology, Medicine, Pul-Medicine, Surgery, Orthopaedics, Psychiatry Paediatrics, Obst&Gynaecology Ophthalmology, E.N.T., Anaesthesiology, Skin & V.D, Cardiology, Nephrology, Gastroenterology, Endocrinology Clinical Hematology, Haepatology, C.T.V.Surgery, Plastic Surgery, Urology, Nurology, Neurosurgery, G.I.Surgery, Paediatric Surgery, Emergency Medicine, Emergency Medicine, Reumatology, Radiotherapy, DENTISTRY, Geriatric Medicine, Oncology, Medical oncology, X-ray Unit Radiation Oncology, Nuclear Medicine, Gynaec Oncology, Surgical Oncology, Radio Diagnosis, Physiotherapy, Transfusion medicine, Pharmacy Unit, X-ray Unit, Ultrasound Unit, CT Scan Unit, Laboratory Unit, M.R.I Unit, Kitchen Unit, Transport & Logistics, Medical Canteen, Ahaar Kendra (Govt Subsidized meal centre), Internal waste Storage Point, External waste storage Point, BMW management Point, Support Departments and Units.
2.	Sardar Vallabhai P.G Institute of Paediatrics	320	
3.	Cuttack District City Hospital	112	
4.	Acharya Harihar Cancer Centre	281	
5.	Anti T.B. Demonstration & Training Centre	71	
6.	SCB Medical College Blood Bank	07*	
7.	Central Red Cross Blood Bank	09*	

**\*Bed meant for temporary rest for Blood donors.**

#### **4. Volume of waste generation**

The total volume of waste was estimated by field visits to the hospitals site following interaction, discussion and interviews with health care and waste management staff. The quantity of waste differed from hospital to hospital as the volume of total waste depended on category of hospitals, available facilities, available specialities and socioeconomic conditions of people visits the health care centres. Further it also depends on location of hospitals and socioeconomic conditions of the locality. The waste volume is estimated by assuming 100 % bed occupancy in all hospitals. The quantity of total waste in blood banks is also calculated by taking into account the total units of blood by individual donors inclusive of total collection with total replacements. The survey shows that the entire biomedical waste which should be kept in yellow, blue and red containers according to the category were found disorderly in one or two containers and the general waste were kept in



black containers. The entire volume of wastes collected are categorized as infectious (general) waste which is non-infectious and biomedical waste as infectious<sup>7</sup>, which is shown in Table -4

**Table-4: Total volume of waste generation in all the studied hospitals of Cuttack City from June 2012-May 2013**  
**\*Bed meant for temporary rest for Blood donors. But wastes generated in Blood Banks are calculated taking into account the total volume of blood collections in a day. In the year 2012-13 total blood collections at\* SCB Blood Bank was 22460 volumes and at \*Central Blood Bank was 41210 volumes.**

### 5.Waste segregation, Collection & Transportation

Sl No	List of Hospitals	No of Beds	Total General wastes (kg)/year	Total Biomedical Wastes (kg)/year	Total volume of wastes (kg)/year	gw/ gm/ bed/ day	bmw/ gm/ bed/ day	Total waste /gm /bed/ day
1	SCB Medical College &Hospital,Cuttack	1310	243290	224977	468267	508.8	470.5	979.3
2	Anti TB Demonstration & Training Centre ,Cuttack	71	8250	5975	14225	318.3	230.6	548.9
3	AH Cancer Research Centre,Cuttack	281	25228	16687	41915	245.9	162.7	408.6
4	Cuttack District City Hospital	112	7633	4999	12632	186.7	122.3	309.0
5	SV PG Institute of Paediatrics ,Cuttack	320	23073	16238	39311	197.5	139	336.5
6	*SCB Blood Bank,Cuttack	7	1797	898	2695	703	351	1054
7	*Central Blood Bank,Cuttack	9	3503	1648	5151	1067	501	1568
	<b>Total</b>	<b>2110</b>	<b>3112767</b>	<b>271422</b>	<b>584189</b>	<b>406.1</b>	<b>352.4</b>	<b>758.5</b>

The biomedical waste should be segregated, separated and put into different colour coding containers as per their category . Though different colour coded containers were kept in the hospital wards but all the wastes were found in one or two containers. No segregation, no labelling of bins, no puncture proof leads closed containers and no sorting of used infected disposables were noticed in most of the hospitals. The waste were found collected from the wards early in the morning in poor quality polythene bags and transported to the off site storage point by hand driven wheeled trolleys having no marking of ‘ bio hazard’ symbol or ‘cytotoxic hazard’ symbol or ‘handle with care’ .

The waste handlers engaged by private agencies were not found to be equipped with protective clothes like gloves, boots and masks. Even they were not properly trained to handle such types of infectious and dangerous wastes. It was revealed from the study that standard operating procedure for biomedical waste management as per rule was not properly enforced and followed in Cuttack City .

## **6. Biomedical waste treatment by Incineration & Non-incineration process**

Biomedical waste particularly infectious and hazardous waste can be treated by the help of incinerator equipped with modern technology which reduces the volume of waste removing and destroying pathogens and toxic elements from the waste. Plastics should not be incinerated . If the incineration system is obsolete without having emission control equipment and does not function in controlled condition properly , it emits large volume of filthy smoke from the half burn infectious waste and toxic gases to the air polluting the entire atmosphere of the area. Uncontrolled incineration is dangerous not only to workers but also to the environment .Non-incineration process like Autoclaving and Microwaving are meant for treatment of sharp waste and infectious waste where as Chemical treatment is typically done for liquid waste and waste released from laboratory cleaning. Biological treatment method is not undeveloped and a rarely used technology for medical waste disposal.<sup>8</sup>Both the processes of treatment of biomedical waste are not strictly followed by the hospitals of Cuttack city according to the guidelines .Even the incinerator which was installed only at SCB medical college Hospital for treatment of its waste was not found in good operational condition.

## **7. Final disposal of treated biomedical waste at Municipal landfill**

After proper treatment the waste should be transported to municipal deep burial site .The remains of waste after incineration and non-incineration processes should be taken for dedicated site by the disposal authority for final disposal as per the guideline which is shown in Table -5. But the mixed waste and discarded non-infected waste generated from all the hospitals of the Cuttack City is directly transported by open tractors and trucks to the Municipal open landfill located at Brajabiharipur for final disposal which has serious environmental implication and health risks to the nearby locality. Even clandestine dumping of hospital waste near the municipal garbage yard by the workers was also detected.

Table –5 - Disposal methods adopted by the hospitals according to the type of waste

Waste types	Waste generation points	Waste Disposal organizations
<p><b>General Wastes(Non-hazardous)-</b> left over foods,fruitpeels,papercaroons&amp;boxes,packagingmaterials,</p>	<p>Office room, Kitchen, Cafeteria, Billing sections,Registration rooms , Administrative blocks, Cashier, Rest rooms, Pantries in wards,patients,wards &amp; Stores</p>	<p>To be collected and managed by municipal authorities</p>
<p><b>General Waste –(non-hazardous(infectious &amp; toxic)-</b>plastic bag, conainer, water bottle, glasses, and tea cups,polythene,medicine wrappers etc.</p>	<p>Generated from all sections and departments of hospitals, wards, ICU, cabins and other health care centres</p>	<p>To be managed by common biomedical waste treatment units , private waste management companies and municipal authorities.</p>
<p><b>Biomedical Waste (infectious,hazardous and toxic)</b> Tissues,organs,blood,pus,bodyparts,usedsyringes,needles,ivbag, blood bag and blood collection tubes ,sharps,bloodlancets,chemicals,soiledressings,bandages,disposal diapers ,absorbent cotton items,culturedishes,discarded blood fluids &amp; radioactive materials etc.</p>	<p>Medical Wards, Treatment, rooms and cabins, nursing homes,clinics and diagonosticcentres, Operation theatres, ICU,OTs and post operative recovery room, , Blood Bank, Pharmacy and Medical Stores, Laboratories ,Pharma</p>	<p>To be managed by common biomedical waste treatment units and private waste management companies.</p>

	units OPDs', Injection rooms etc.	
--	-----------------------------------	--

## RESULT AND DISCUSSION

**1. Generation of Biomedical waste:** Hospitals, blood banks, diagnostics centres and other health care facilities generate both infectious and non-infectious wastes. Non-infectious wastes are general waste which includes leftover foods, packaging materials etc. Infectious waste is hazardous which includes body parts, waste sharps, chemical and pharmaceutical waste etc whose treatment is essential before its final disposal. Any mismanagement of such waste may lead to health and environmental impact on the area. The volume of waste generated in hospitals depends on a number of factors like number of beds, provision of health care facilities, cultural and socioeconomic status of the patients of the geographical location of the hospitals.

**2. Segregation of Biomedical waste:** Waste segregation is the key to waste minimization. Segregation of biomedical waste on the point of generation into different categories is the most important part of waste management. This is a first step before onsite storage of biomedical waste for subsequent disposal. During my visit to hospitals it came to my notice that proper segregation of biomedical waste was not conducted according to the rules and operating procedures as per law. But all the hospitals and blood banks have installed red, blue, yellow and black colour coded containers in almost all the wards for separation of waste. It was found that the doctors and nurses are not serious and do not pay attention to drop the particular waste into the particular container. However, in a few wards in some hospitals separation of infectious waste and general waste was done to some extent.

**3. On-site Transportation of Bio-Medical Waste:** As per the norm biomedical wastes are to be collected and transported to the on-site storage point on regular interval and should not be kept beyond twenty four hours. The waste must be transported by dedicated, sanitised and wheeled trolleys, carts, or containers having closed carriers. The wastes are to be kept in the temporary storage area of the hospitals till off-site transportation. The personnel engaged to collect and transport waste must wear protective clothes, uniforms, aprons, footwear, gloves, masks and any other necessary equipments for safety. The hospitals must ensure maintaining daily records of volume and disposal

of wastes. But during my spot visit it was revealed that standard operating procedures are not found maintained properly.

**4. On-site Storage and treatment:** The on-site storage area of biomedical waste should be nearest to the point of generation. The wastes are transported within twenty four hours from this temporary storage point. Minimum 2% bleach solution should be put into the container meant for storage of highly infected waste. The infectious and non-infectious wastes should be placed in separate colour coded containers and should not be mixed together until it is disinfected. Incineration and Autoclaves / Microwave/Hydroclave must be used for treatment of infectious and sharp wastes according to the waste category. As treatment was not done properly at onsite storage points of hospitals both the municipal wastes and biomedical wastes get mixed together turning the whole wastes into infectious wastes.

**5. Off-site Transportation and disposal of Biomedical Waste:** The treated waste should be disposed off in a dedicated deep burial site or in a Municipal landfill surrounded by high raising boundary wall and away from human habitation. It should be transported by vehicles having closed containers. But the mixed infectious waste from all hospitals are found transported by open tractors and trucks to the offsite disposal point which is an open Municipal landfill located at Brajabiharipur nearby the City.

### **Major drawbacks of biomedical waste management of Cuttack City and challenges to Clean India Mission**

- a) Generation huge quantity of biomedical wastes due to increasing patients and health care centres but lack of proper management practice.
- b) Lack of colour coding, segregation practices, lack of storage, treatment and unsystematic operational strategy.
- c) Lack of education, training and proper protective equipments to waste handlers.
- d) Open disposal of biomedical wastes by clinics and nursing homes in the in Mahanadi and Kathajodi riverside due to inadequate space.
- e) Poor implementation of regulation, lack of supervision and lack of awareness among hospital staff and public
- f) Collection of biomedical waste by rag pickers and reusing of medical waste items
- g) Incinerator installed at SCB Medical college Hospital is symbolic one which is poorly operated, improperly maintained, very often found to be non-functional and non-compliance of adequate pollution control devices

- h) Absence of Common Bio-medical Waste Treatment Facility (CBWTF) and lack of secured Municipal landfill or deep burial site.
- i) Financial constraints and lack of eco-friendly waste management policy

## **CONCLUSION**

In recent years biomedical waste management has become a topic of discussion among the public world wide. Due to socioeconomic development, growth of hospitals and other care facilities are emerging at a first rate. But the management of these wastes generated from these institutions has become a major challenge to the administration due its adverse impacts to the health and environment. Despite efforts ,the present waste management practice by the hospitals and other health care centres of Cutack City are in infant stage which needs intervention on war footing for further improvement. The city is deprived of Common Biomedical Waste Treatment Facility ,absence of Secured Municipal landfill/ burial site and lacks of specialized services and modern technology for waste collection, segregation ,storage,treatment, transportation and disposal. As the present practice of biomedical waste management does not comply to the rules and regulations which may lead to adverse impact on public health and environment at any time. Therefore, scientific management of biomedical waste at every stages from generation to final disposal with the help of trained personnel and use of latest technology is need of the hour .

## **ACKNOWLEDGEMENT**

The present research was carried out and supported by the authors of this paper. We deeply thank to our colleagues, staff and well wishers who extended their expertise and experience in providing insight to this work that assisted this research work. We thank to staff of Hospitals, Blood Banks and working personnel engaged in waste management agencies who provided us support in conducting the field study and survey for the research.

## **REFERENCES**

1. Sreekumar PR, Nair ASK. Bio Medical Waste Disposal and Its Status in Kerala.
2. Hegde V, Kulkarni RD, Ajantha GS et al. Biomedical waste management. J. Oral and Maxillofacial Pathol. 2007; 11 (1): 5 –
3. World Health Organisation (WHO). Safe Health- Care Waste Management: A Policy Paper; *Pal, et al.* 2004
4. Lupe P, Traditional Medical Waste Treatment; 2009

5. Biomedical Waste( management and handling) Rules ,Ministry of Environment and Forests- New Delhi 1998& as amended in 2011
  6. Rao HVN. Disposal of hospital wastes in Bangalore and their im14. Saini RS, Dadhwal PJS. Clinical waste management: a case study. Journal of Indian Association for Environmental Management. 1995; 22: 172–174.
  7. Saini RS, Dadhwal PJS. Clinical waste management: a case study. Journal of Indian Association for Environmental Management. 1995; 22: 172–174.
  8. WHO Report: A Report on Alternative Treatment and Non-Burn Disposal Practices. Management of Bio-medical Sharps Waste in India; 2005. Almuneef M, Memish Z. Effective medical waste management: it can be done. American Journal of Infection Control. 2003; 31:188–192.
-