

# Impact Assessment of Bio-Medical Waste in Southern Rajasthan

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**Abstract**—To study the actual condition of hospital waste management system in India in particular reference to Rajasthan, finding out the factors affecting the hospital waste management, its hazardous effects and facilities provided to health waste management worker and to study about the present hospital waste management policy of Rajasthan. **Methods:** Proposed research work was based on primary as well as secondary data. Primary data was collected through questionnaire technique. Questionnaire contained both open and close ended questions. Secondary data was collected through post research reports, commissions, magazines, books, articles and journals. In this study two leading hospitals of Udaipur headquarter were selected one from government sector and one of private sector. A total of 200 persons were interviewed. **Results:** The results showed that there was a poor level of knowledge and awareness of biomedical waste generation hazards, legislation and management among health care personnel. This is evident from survey findings that 45 percent respondents are fully aware of legal or procedural issues of the bio-medical waste management system as per their knowledge. **Conclusions:** It can be concluded from the present study that there are poor levels of knowledge and awareness about BM waste generation hazards, legislation and management among health care personnel in southern Rajasthan. Regular monitoring and training are required at all levels.

**Key words:** Bio-Medical Waste, Healthcare Institutions, Infectious and Hazardous Waste Items, Incineration, Autoclave, Microwave

## I. INTRODUCTION

Environment Protection Act 1986 and Bio-medical Waste Management and Handling Rules 1998 made handling of bio-medical waste in systematic manner, as there remains various infectious and hazardous components harmful for people and environment. Rules manifested system of collection, segregation, keeping different category of medical wastes in different colour containers as well as disposal of bio-medical waste in incineration, autoclave and microwave system as per category of waste. Even after more than 15 years, systematic disposal of bio-medical waste is not being carried out in most of the healthcare institutions as per Rules. Southern Rajasthan comprising of six districts have similar problems of disposal of bio-medical waste which is still not managed as per Rules. The infectious and hazardous contents create serious problems to people and environment.

Rajasthan is the biggest state of the country in geographical area spread over 342239 sq km, which is 10.41 percent of country, but population of the state as per 2011 census is 6.86 crores i.e. 5.67 percent of the country. Almost 61 percent of state area is part of the Great Indian Desert, the Thar having population of 39 percent of the state, while mountain, plateau and plain area is 39 percent having 61 percent population concentration. Southern Rajasthan covers districts of Udaipur, Rajsamand,

Dungarpur, Banswara, Pratapgarh, Chittorgarh, having total geographical area of 36942 sq km, i.e. 10.79 percent of the state, while population of Southern Rajasthan is 98.25 lakhs, which is 14.31 percent of the state. This reveals that the area has higher population pressure with lesser area.

Dungarpur and Banswara are classified as tribal districts having more than 50 percent tribal population while other districts have tribal blocks with more than 50 percent tribal population, as remaining four districts do not qualify for being tribal districts. Funds for tribal area development are being received from the Government of India and healthcare facilities have been provided by the state government to cover larger area of rural and urban population. Udaipur is divisional headquarter of Southern Rajasthan covering all the six districts of the region. Udaipur has medical colleges associated with super-specialty hospitals, where serious cases of Southern Rajasthan and nearby areas of Madhya Pradesh and Gujarat are referred in view of fame of medical care institutions.

In addition to super-specialty medical facilities existing in Udaipur city, each district has district hospitals, network of community health centers, primary health centers and aid posts besides network of clinics, dispensaries, pathological laboratories and blood bank to attend all the related problems of human patients. In addition, veterinary colleges, dispensaries, animal houses and meat production centers exist in the region to meet animal health and meat requirement of the people. All the healthcare institutions functional in southern region of the state generate bio-medical waste due to treatment and examination of human patients and animal treatment. Thus voluminous infectious and hazardous bio-medical wastes are generated in all the healthcare institutions.

The World Health Organization (WHO) had directed all the member countries for systematic collection, segregation and disposal of infectious and hazardous bio-medical waste contents in instructed manner, where central systematic disposal incineration, autoclave and microwave systems need to be established as per directions of the Environment Protection Act 1986 and Bio-medical Waste Management and Handling Rules of 1998. The quantum of bio-medical waste per bed per day was estimated by the World Health Organization of 1 to 5 kg as hospital waste of which 10 percent contents are estimated to be of infectious and 5 percent of hazardous nature, which need systematic disposal to keep the area clean and people remain free from infectious and hazardous contents.

No efforts for assessment of bio-medical waste could be made at national or state level. So, the efforts have been made by the research scholar for assessment of quantum of infectious and hazardous bio-medical waste contents from Ravindra Nath Tagore Medical College Udaipur and associated hospitals i.e. Maharana Bhupal Hospital with 1306 beds, Pannadhay Zanana Hospital with 440 beds and TB and Chest Hospital with 260 beds.

Another medical college of Udaipur city covered in the research study is Geetanjali Medical College having

associated 850 bedded Geetanjali super specialty hospitals. Thus total bed strength of both medical colleges and their associated hospitals is 2856 beds, where total hospital waste generated per bed per day was 1.740 kg where infectious and hazardous bio-medical waste contents were 2.96 gram i.e., 17.01 percent of total hospital waste. This information has been derived with assessment in all the wards of hospitals with regular intervals and five time quantity assessment deriving total hospital waste as well as bio-medical waste of infectious and hazardous nature. The colleges and their associated hospitals covered under assessment had their final disposal units of infectious and hazardous wastes within the campus of institutions.

## II. HEALTHCARE INSTITUTIONS HAVING NO FINAL DISPOSAL MEASURES

It has been witnessed that district hospitals, dispensaries, community health centers, primary health centers, veterinary dispensaries, animal houses, meat production centers, pathological laboratories etc. have no individual bio-medical waste disposal units. Similarly, no efforts have been made by the state government for installation of central disposal plants in each district to meet requirements of uncovered healthcare institutions of human and animal treatment institutions. Before enactment of Environment Protection and Act 1986 and Bio-medical Waste Management and Disposal Rules 1998, no uniform system for disposal of infectious and hazardous waste contents was practiced and even after fifteen years of the application of Rules, most of the healthcare institutions still do not have systematic disposal system of bio-medical waste.

## III. IMPACT OF LACK OF FINAL DISPOSAL MEASURES

The World Health Organization had classified medical waste into eight categories comprising of general waste, pathological, radio-active, chemical and infectious to potentially infectious waste, sharps, pharmaceuticals and pressurized containers. The Ministry of Environment and Forests had classified bio-medical waste into ten broad categories, comprising of human anatomical waste, animal waste, micro-biology and bio-technology wastes, waste sharps, discarded medicines and cytotoxic drugs, soiled waste, solid waste, liquid waste, incineration ash and chemical waste. This has been advised to finally dispose these bio-medical wastes through incineration, autoclave and microwave systems with indicated manner. Presently more than 90 percent of bio-medical waste of infectious and hazardous nature is not disposed through the instructed system.

The indiscriminate management of bio-medical waste can cause serious hazards for health and environment. There are many harmful agents in the bio-medical waste comprising of biological agents, which pollute water, food and cause alimentary infections like cholera, typhoid, dysentery, infective hepatitis, polio, ascariasis and hook worm diseases. Waste breed mosquitoes that transmit insect born diseases like malaria and filaria. Common house flies transmit infections mechanically, while many other insects and worms like cockroaches, ants cause nuisance and rats thriving on refuse. Dust may harbour Tubercle Bacilli and

other germs, which cause diseases, if inhaled. Soil polluted by night soil may be rich in Tetanus spores.

Nosocomial infections and AIDS, Hepatitis B and C are caused through infectious needles or syringes. Sullage water, refuse and night soil create intolerable nuisance of sight and smell. The blood born pathogens have gained significant attention after the attack of HIV and HBV, HCV, which can lead to AIDS and Hepatitis B, C etc in addition to other viral and bacterial infections. The Hepatitis B virus (HBV) carries greatest risk of transmission as about 25 percent of HBV infected persons develop acute Hepatitis with the possible complications of cirrhosis of liver and liver cancer. The HBV transmission is quite similar to HIV, which occurs through direct contact between an open wound, non-intact skin or mucous membrane, contaminated blood, body fluids, sexual contact through transplacental route.

The needle prick injuries and broken injection foils may cause transmission of HBV, while HIV is the most critical infection with no cure. The outbreak of TB among hospital employees and other nosocomial infections among patients are largely attributed to the low index of suspicion for TB and delayed diagnosis. The outbreak of cholera and other water born diseases are also attributed to indiscriminate management of bio-medical waste. These all problems of people and environment are due to lack of government initiative to take care of final disposal of infectious and hazardous bio-medical waste generated in healthcare institutions. It has been indicated in Bio-medical Waste Management and Handling Rules that state government should install central or individual incineration, autoclave and microwave systems to dispose all infectious and hazardous wastes.

## IV. REASONS FOR INDISCRIMINATE HANDLING OF BIO-MEDICAL WASTE

The state government of Rajasthan has not prioritized bio-medical waste management and unable to provide requisite funds for installation of final disposal plants in each district to cover all the healthcare institutions generating hospital waste. In addition, there is lack of managerial skill and training of bio-medical waste management. The state also lacks appropriate technologies for treatment and disposal of bio-medical waste. There is general lack of strict implementation of infection control measures like sterilization and disinfectant techniques. It has also been witnessed that medical personnel, patients, attendants and general public do not have awareness of the infectious contents generated and thrown on roads or healthcare areas causing various problems to people.

It has also been observed that there is immense lack of coordination between municipal bodies, State Pollution Control Board and healthcare authorities functional under the ownership of government and private concerns. There is also lack of accountability among the personnel involved in the management of bio-medical waste. In view of all these situations, the state government is unable to manage final disposal system of collection, segregation and keeping in different colour containers for transportation to final disposal centers, which could not be established due to indecisiveness of the state government. It is major issue of concern that state government has established various

healthcare institutions and private sector but unable to enforce instructed system of final disposal.

#### V. PERSONS AT SERIOUS RISK

The doctors, nurses, technicians, waterman, sweepers, hospital visitors, patients, rag pickers etc are routinely exposed to bio-medical waste and are at most risk from many fatal infections due to indiscriminate management of bio-medical waste. The ethical aspects related to the social responsibilities, which the health professionals have, as a result of their status, knowledge and skills and an obligation to alert those who are at risk. This is reflected by compulsory notification of infectious and notifiable diseases as a measure of public welfare.

#### VI. MITIGATION MEASURES OF BIO-MEDICAL WASTE

It is certainly true that bio-medical waste contains various infectious and hazardous contents harmful for people and environment, if such contents are not disposed in instructed manner. The Bio-medical Waste Management and Handling Rules 1998 have clearly instructed all the state governments and union territories to collect, segregate, keep different categories of bio-medical wastes in different colour containers and transport to disposal site through specific vehicles having logo of bio-medical waste. The healthcare institutions need to maintain record of each category of bio-medical waste in different containers to carry along with letter to final disposal authority with number and date of collection and segregation. The incharge of disposal site needs to register all such bio-medical waste contents from each healthcare centre in case of central disposal site and within the hospital campus.

The state government of Rajasthan has established disposal sites in all medical colleges and associated hospitals and similar practice is maintained in private medical colleges and associated hospitals. Presently district hospitals, dispensaries, community health centres, primary health centres, clinics, pathological laboratories, animal houses, veterinary dispensaries and meat production houses are still uncovered with individual or central disposal sites comprising of incineration plant, autoclave and microwave system as instructed by the Ministry of Environment and Forests through Rules..

The mitigation measures of bio-medical waste are abiding on all the healthcare institutions comprising of government and private hospitals, dispensaries, nursing homes, clinics, veterinary institutions, animal houses, pathological laboratories, blood banks etc. The Rules are meant for all healthcare institutions treating 1000 patients per month and system of final disposal is necessary to be managed in each such healthcare unit individual or central disposal establishment for various healthcare institutions functional in any city, district or other administrative unit as per feasibility. The incineration, autoclave and microwave systems need to be established as per capacity of bio-medical waste handled by such plants. The suggestions made for mitigation of all such problems are given below:

- Registration of All Eligible Health Care Institutions is mandatory under the Bio-medical Waste Management and Handling Rules, as registration form is to be submitted by each eligible institution to State Pollution

Control Unit, which authorizes such institution for handling of bio-medical waste generation. It is duty of the state government to manage registration of all eligible healthcare institutions with the Board for regular reporting and inspection of system of bio-medical waste management as per Rules.

- Management of Incineration Plants, autoclave and microwave systems is necessary in all the districts of the state. Such establishments need to be managed as per quantum of bio-medical waste to be handled by one central unit in each district. In case the quantum of bio-medical waste is more beyond the capacity of one unit, two or more units be established in each district. The list of all the districts be prepared for number of units necessary in each district. The state government need to manage such units at their own cost and in case of funding problem, task of transportation and establishment of such final disposal units be entrusted to private sector, which can work under the guidance of state and district level committees already functional in the state. Cost of final disposal and transportation be finalized for each healthcare institution to be provided to owner of such plants.
- Designation of One Nodal Department for total bio-medical waste management be handed over to one administrative department out of five such departments, as the task is not functioning in systematic manner. For this purpose Medical and Health Department can be entrusted, which can manage all the final disposal plants in government or private sector as per feasibility. Issue of instruction to state and district level committees and all the healthcare institutions be responsibility of such administrative department and manage total system to ensure complete disposal of bio-medical waste as per Rules. All the remaining administrative departments need to attend the task in their sphere as per decisions taken by such designated department.
- Responsibility of Medical and Health Department would increase with designation of administrative department and such tasks need to be managed by it with the help of District Medical and Health Units functional in all the district, which would coordinate with animal husbandry department, veterinary department, medical colleges and State Pollution Control Board for complete management of activities related with the bio-medical waste management in all the uncovered healthcare institutions where registration and total bio-medical waste need to be ensured in systematic manner. The district level committee of bio-medical waste management need to function in coordination with the District Medical and Health Officer for management of total system related to bio-medical waste management.
- Responsibility of Animal Husbandry Department will be of coordination at state and district levels, where registration of all eligible healthcare institutions be carried in consultation with Medical and Health Department. It has to be ensured that all the healthcare institutions of the animal husbandry carry out total bio-medical waste in systematic manner, where collection, segregation and keeping each category of bio-medical waste in different colour containers would be

responsibility of each health care institution. The vehicle would collect total disposable waste from the campus of each healthcare institution through transport vehicle to reach at disposal site having complete information in letter to final disposal unit incharge. .

- Responsibility of State Pollution Control Board would continue to be nodal agency of management and handling of bio-medical waste and registration as well as authorization to all healthcare institution would continue to be handled by the board. Medical and health department would continue to instruct eligible healthcare institutions for registration and authorization for handling of bio-medical waste. The Board would continue to insist all the healthcare institutions for collection, segregation and packing of bio-medical waste in different colour containers as per Rules and would be authorized to carry out inspection for systematic handling of bio-medical waste. Medical and health department and state and district level committees would continue their task as per directions of the state government and Board would watch overall functioning of healthcare institutions related to bio-medical waste management.
- Effective Role of State and District Committees is necessary for smooth functioning of the bio-medical waste management in terms of coordination among the healthcare institutions and various administrative departments. Such committees would report the lacking areas of each health care institutions in total task of bio-medical waste management. The state level committee would continue to assist State Medical and Health Department as nodal department of task and continue to assist in issue of instructions to all district level committees and report lacking areas observed as per their assigned tasks. The state and district committees be entrusted task of attending complaints received from district administration, general people and aggrieved persons for nuisance felt by individual or group of persons for wrong implementation. However, all the actions and instructions would be issued by medical and health department as nodal administrative department.
- Safety of Healthcare Institutions and Staff is necessary as people reach to healthcare institutions for treatment of diseases of the patients, but if the institutions are not free from infectious and hazardous contents of critical nature, patients and people would loose their faith in such institutions and accordingly total area of each healthcare institution need to remain free from all the infectious and hazardous contents. Various healthcare institutions attend critical communicable diseases and environment needs to be free from all such problems. Similarly, doctors, para-medical staff, attendants and cleaners work in the hope to remain free from infections from bio-medical waste. These persons attend various patients gripped with serious problems and safety of total functionaries of healthcare institutions is necessary.
- Knowledge of Infectious and Hazardous Contents is necessary to total functionaries of healthcare institutions, patients and attendants, who reach to such institutions for various reasons. It is essential that all the functionaries of health care institutions remain cautious

while operation, removing of fluids in infected parts of body and injection and using sharps, which should not affect their parts during such process. Similarly the patients need to remain alert while taking medicines, injections and removing their fluid with disposable instruments. Medicines must within the prescribed date and other contents should be free from infections. It is necessary to see the medicines given to them are appropriate as prescribed by doctor. Attendants of patients need to carry appropriate medicines and other items as per prescription of doctors.

- Effective Role of Media is necessary in management of bio-medical waste in systematic manner and any syringe, needle, sharps, outdated medicines or unconsumed medicines, body parts etc need not be thrown in open or collected by rag-collecting persons Such persons can be infected with the infectious and hazardous contents. Similarly the thrown syringes, glucose bottles and other recyclable items should not reach to pharmaceutical companies to sell those as new items. Similarly, persons be made aware for wrong disposal of bio-medical waste on roads or dumping places of municipal waste. Such issues need to be published for keeping the healthcare institutions alert for their wrong acts.

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