CHAPTER-6

CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS FOR IMPROVEMENT IN MANAGEMENT

Conclusion is categorized in two groups:

6.1: (a): Conclusion based on Questionnaire filled by the respondents.
(b): Conclusion based on physico-chemical analysis of the samples.

6.1 (a): Conclusion based on Questionnaire filled by the respondents and amount of waste generated and disposal selected hospitals after survey:

The biomedical waste management practices in some selected hospitals under the study were found to be inadequate, insufficient and unsafe. The attitude, knowledge and practices regarding biomedical waste were found to be insufficient among doctors, paramedical staff and auxiliary staff. Potential health hazard, risk and impacts associated with the healthcare sector is not properly documented and shared with affected workers. On the basis of this study it is recommended that the Government should time to time launch several training programs which generate awareness among the people regarding ill effects of bio-medical waste on our environment and on human health.

If the strategies of biomedical waste Management are not effective it may lead to serious health hazards and spreading environmental diseases. Hospital superintendents, Government Health administration and public
awareness need to pay their specific attention to this important issue of health and hygiene.

After analyzing the result of the study it is felt that there is an urgent need to standardize the infrastructural requirement. Hospitals having defective incinerators should be made to utilize central incineration facility as efforts of government are towards reducing the number of incinerators in cities to prevent rise in pollution.

Government hospitals which at present are totally left on their own should be brought into net of rigorous checking as far as biomedical waste management is concerned and a corpus grant can be allotted to them to improve their infrastructural requirements for which provision exists in the rules of government of India.

Workshops, seminars and exhibition etc must be organized from time to time which inform the public and biomedical waste management workers about rules and regulations regarding biomedical waste management and risks involved due to improper disposal of biomedical waste. Information about the risks associated to hospital waste can be displayed by poster exhibitions at health care units, strategic points such as locations of waste bins and instructions giving on waste segregation. These posters should be made in such a way that illustrations and diagrams may convey the message that could be understood by all people.

All the Governmental bodies, private health care sectors in collaboration with Lucknow authorities, local help groups and general
public should work together to find a proper management bio-medical waste and handling procedures, which should be in accordance with the Bio-medical waste (Management & Handling) Rules, 1998.

5.2: Conclusion based on physico-chemical analysis of the samples:

The study shows that all the parameters in water and soil samples were found to be highest in Hospital-D in summer season except TDS which was found to be highest in Hospital-A and minimum values were found in Hospital-E in winter season except TSS which was found to be minimum in Hospital-C in the same season.

Parameter like pH, EC, Sulfate and Nitrate were found to be within a permissible limit prescribed by WHO, BIS and ICMR (Annexure-2) whereas the parameters like TSS, TDS, Cadmium, Iron, Potassium, Zinc and Chromium were found above the permissible limits in water samples. In soil samples parameters like Cadmium, Arsenic Manganese and Iron are found within the permissible limits whereas Lead and Zinc exceeds the limits.

Microbial activities were also found to be more in Hospital-D compare to other sites. So from the above it is clear that Hospital-D is spreading more pollution than the other selected sites.

So the conclusion is that the waste water released from the drainage system of health care units are highly contagious and may infect human body and his environment, if it is not properly treated. When this waste water may enter into the pipe line of water system or absorb by the soil after leakage may harm the microbial activity of that area and also produce harmful microbes which generate different types of contagious diseases in
the human body and also pollute the underground fresh water resource of that site. Therefore that water is not suitable for beneficial purposes like drinking, bathing and causes obnoxious odour to that area.

In the same way if these biomedical waste or infected ash produced after incineration are dumped in open areas of the land also degrade the valuable importance of that location. These areas are not suitable for human settlements.

6.2: Recommendations and Suggestions:

These are as follows:

- Review of the waste management policies should be done so that it focuses not only on the waste minimization strategies but should also contain strategies to encourage greater engagement and to change the intended behavior to a more sustainable behavior.
- Should improve the waste management techniques by making proper arrangements to seal the medical waste bin when it is 3/4th full.
- More frequent waste collection. The waste manager should consult with the staffs and a consensus should be made on the location of waste bins.
- The employees should be highly encouraged to inform the waste management team whenever they have put wrong waste in wrong bin.
- Should consider record, track and monitoring for the waste generation pattern for each wards.
• Should encourage the proper waste management practice especially among the employees and students in younger age group.
• The researcher highly recommends for a follow up study on the cost benefit analysis or a feasibility study of an on-site incinerator.
• Public awareness against defaulters for recourse to legal action.
• Training should be given to certain number of persons from staff for the use of incinerator.
• Specific fund should be allocated for the use of incinerator.
• Every hospital should have boxes to use as dustbin for biomedical waste.
• Hospital waste should not be mixed with other waste.
• Private hospitals should also be allowed to use incinerators, which are installed in government hospitals. For this purpose, a specific fee can be charged from private hospitals.
• Special vehicles that means biomedical waste vehicle should be started to collect waste from private hospitals and private medical clinics and carry it up to the main incinerator.
• According by bio-medical waste rules, the whole of the waste should be fragmented into colors due to their hazardous nature.
• Bio-medical waste management body can be established in each district.
• Either judicial powers should be provided to the management board or special courts should be established in relation to environment pollution for imposing fines and imprisonments for damages.
- Housekeeping staff should wear protective devices such as gloves, face masks, gowned while handing the waste.

- There should be biomedical label on waste carry bags and waste carry trolleys and also posters should be put on the walls adjacent to the bins giving the details about the types of waste that has to be disposed in the baggage as per biomedical waste management rule. Carry bags should also have the bio hazardous symbol on them.

- **Offences and Penalties:** Whoever fails to comply with or contravenes any of the provisions of this Act, or the rules made or orders or directions issued there under, shall, in respect of each such failure or contravention, be punished with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees, or with both, and in case the failure or contravention continues, additional fine may be imposed extending to five thousand rupees per day.

- If the failure referred to in sub-section-a continues beyond a period of one year after the date of conviction, the offender shall be punished with imprisonment for a term which may extend to seven years.

- Although these bio-medical waste management programmes cannot successfully be implemented without the devotion, self-motivation, cooperation, willingness and participation of all sections of employee of any health care centers. If we want to protect environment and human health, we must realize the importance of this issue not only in the interest of health managers but also in the interest of community.
Recommendations at the level of health care establishment:

Responsibilities of waste generators:

Waste generators are required by law as stated in section-(ii), to ensure proper handling, collection, storage, transportation and disposal of the waste they generate. The White Paper on Integrated Pollution and Waste Management emphasizes the duty of care as one of the responsibilities of the health care waste generator.

Assignment of responsibilities:

- The proper management of biomedical and health-care waste is largely dependent on good administration and organization. These should be supported by adequate legislation and financing as well as active participation of trained and informed staff.
- The head of the hospital should establish a waste management team to develop a waste management plan. The head of the health care centres should formally appoint the members of the waste management team in writing, informing each of them of their duties and responsibilities.
- Depending on the availability of relevant personnel, the post of waste management officer may be assigned to the hospital engineer, the hospital manager, or any other appropriate staff member, at the discretion of the head of the hospital.

Duties of the head of the hospital:

The head of the health-care establishment is responsible for the following tasks:

- Keeping the management plan and record up to date.
• Allocation of sufficient financial and manpower resources to ensure efficient operation of the plan.
• To ensure that monitoring procedures are incorporated to assess the efficiency and effectiveness of the disposal system and to effect the continuous improvement and updating of the system where appropriate.
• To ensure adequate training for key staff members, he shall designate staff responsible for coordinating and implementing training courses.
• Ensuring adequate emergency response planning.

Duties of the Waste Management Officer:

• The waste management officer is responsible for the day-to-day operation and monitoring of the waste management system. He shall have direct access to all members of hospital staff to facilitate his control function. The waste management officer will be directly accountable to the head of the hospital. He shall liaise with the infection control officer, the pharmaceutical officer and the radiation protection officer to familiarize himself with the correct procedures for handling and disposing of pathological, pharmaceutical, chemical and radiological wastes.
• Concerning waste collection, the waste management officer should undertake the following tasks:
  ➢ Controlling internal collection of waste containers and their transport to the central waste storage facility of the hospital, on a day-to-day basis.
- Ensuring the supply of items required for waste collection and handling, he should liaise with the supplier department to ensure that an appropriate and acceptable range of health-care waste bags and containers, protective clothing and collection trolleys are available at all times.
- Directly supervising hospital attendants and ancillary workers assigned to collect and transport health-care waste.

Concerning waste storage, the waste management officer should:
- To ensure the correct use of the central storage facility for health-care waste at the health-care establishment, which shall be fenced with a lock on the entrance.
- Prevent unsupervised dumping of waste containers on the hospital grounds, even for short periods of time.

To supervise evacuation or disposal of the waste, the waste management officer should:
- Monitor and coordinate all waste disposal operations.
- Monitor methods of transportation of wastes on-site and off-site and ensure that wastes collected from the hospital are transported by an appropriate vehicle to the designated incinerator.
- Ensure that waste is not stored in the hospital grounds for periods longer than specified in the guidelines and that the required frequency of collection is maintained.

For staff training and information, the Waste Management Officer should:
➢ Liaise with the matron and the hospital supervisor to ensure that the nursing staff and medical assistants are familiar with their responsibilities of segregation and storage of waste and of the limited responsibilities of hospital attendants and ancillary staff in the handling and transporting of sealed waste bags and containers.

➢ Coordinate with head departmental heads to ensure that all doctors and other qualified clinical staff are aware of their responsibilities regarding segregation and storage of waste and of the limited responsibilities of hospital attendants and ancillary staff in the handling and transporting of sealed bags and containers.

➢ Ensure that attendants of health care centres and ancillary staff are not involved in waste segregation and that they handle only waste bags and containers sealed in the correct manner.

• For incident management and control, the Waste Management Officer should:
  ➢ To ensure that emergency procedures are available at all in place and at all times and those personnel are aware of the appropriate action to be taken.
  ➢ To investigate any incidents reported during the handling of health-care waste.

• Emergency response:
  For health-care establishments, spills of infectious or other hazardous material or waste are probably the most common
emergencies related to hazardous material. Basically, the same response procedures are applied, regardless of whether the spills are from material or waste. The response to emergencies should ensure the following:

- The waste management plan should be respected.
- Contaminated places should be cleared and, if necessary, disinfected.
- The exposure of waste handling workers should be limited as much as possible during the operation.
- The impact on our surrounding should be limited to the extent possible.

- The staff should be well prepared for emergency responses, and the required equipment should be easily available at all points in time and within reasonable distance to ensure that an adequate response can be made safely and routinely. The procedures for the different types of emergencies should be written down. For dangerous spills, clean-up should be carried out by designated, specifically trained personnel.

Dealing with spills:

- Spills usually require only clean-up of the contaminated area. In spills of infectious agents, it is important to determine the type of infectious agent, as some may require immediate evacuation of the area, whereas others require fewer precautions. The more hazardous spills usually occur in laboratories rather than in healthcare departments.
• Spill-cleaning procedures should specify safe handling operations and appropriate protective clothing. Appropriate equipment for collecting the waste and placing it in new containers, and for disinfection, should be provided.

• **Technology or process change**, e.g., using nonmercury-containing equipments instead of mercury thermometers or mercury switches, using ultrasonic or steam cleaning cleaners instead of chemical-based cleaners.

**Example of general procedure for spill-cleaning:**

- Evacuate the contaminated area.
- Determine the nature of the spill.
- Inform the designated person (usually the waste management officer).
- Eye and skin decontamination (disinfection) of exposed personnel should take place immediately.
- Evacuate all the people not involved in cleaning up if agent is particularly hazardous.
- Protect the area to prevent additional exposure of persons.
- Limit the spread of the spill.
- Provide adequate clothing to personnel involved in cleaning up.
- Neutralize or disinfect the spill or contaminated material if indicated.
- Provide first aid to injured persons.
- The spill and the contaminated material like sharps should
never be picked up by hand, but with tools like pans or brushes.

- Spilled material and contaminated items used for cleaning should be placed into the appropriate bags or containers.
- Decontaminate or disinfect the used tools.
- Take off protective clothing and decontaminate or disinfect it if necessary.
- Seek medical care if exposure to hazardous material has occurred during the operation.

**Source: WHO guidelines.**

(Note: Bleaching powder, which is a mixture of calcium hydroxide, calcium chloride and sodium hypochlorite can be used in the powder form or in solution of varying dilutions (1:1 to 1:100) for disinfection, depending on the nature of the spilled material.)

**Response to injuries:**

A response programme should be established for immediate reaction to injuries or exposure to a hazardous substance. All staff handling biomedical and health-care waste should be trained in dealing with injuries. Such a programme should include the following elements.

- Immediate medical care such as cleansing of wounds, skin and splashing of eyes.
- Immediate informed to a responsible designated person.
- If the retention is possible, of the item and details of its source for identification of possible infection.
• Additional medical care in an accident, emergency or occupational health department should be provided as soon as possible.
• Medical surveillance.
• Blood or other tests if indicated.
• Recording of the incident.
• Investigation, implementation and determination of remedial actions.

**Reporting accidents and incidents:**

All waste management staff should be trained in emergency response and made aware of the correct procedure for prompt reporting of accidents and incidents. Accidents or incidents, including near-misses, spillages, damaged containers, inappropriate segregation or any incidents involving sharps should be reported by the Waste Management Officer if waste is involved, or otherwise to another designated person. The report should include:

(a) What is the nature of the accident or incident?
(b) Where and when it occurred?
(c) Which staff was directly involved?
(d) What are other relevant circumstances?

The incident should be investigated by the responsible officer (Waste Management Officer in cases of waste) to establish its causes or if possible action should be taken to prevent recurrence.

Records should be kept. List of items for spillage-cleaning action tools or items approaching the spillage protective equipment containing the
spillage absorbent material like absorbent paper, towels and gauze pads can be used.

For Neutralizing or disinfecting the infectious material disinfectant can be used.

For acids: sodium or calcium carbonate or other base can be used. 
For cytotoxic material: special chemical degradation substances can be used.
For bases: citric acid powder or other acid electing the spillage can be used.
For liquids: absorbent paper, diatomaceous earth, gauze pads and wood shavings etc. can be used.
For solids: forceps, brooms, dust pans or shovel can be used.

Containment for disposal For Mercury: mercury sponge or vacuum pump. Plastic bag (red, yellow or brown, as appropriate), sharps container decontamination or for infectious material: disinfectants can be used. For disinfection of the area for hazardous chemicals: suitable solvent or water can be used.

6.3: Area for Further Research:

This thesis focuses reasons for barriers to effective management of biomedical waste as a source of infectious and contaminated diseases. Some areas for further research in this area are:

- Study on risks and impacts of a lack of effective biomedical waste management standards and regulations for healthcare centres.
• Number and types of injuries and illnesses amongst healthcare workers.
• Effectiveness of a free costs structure in healthcare sectors in the Lucknow.
• Survey should be conducted on the general immunization program in the Lucknow.
• Benefits and risks associated with use of contracted workforce within the public health Places.
• Assessment of public versus private healthcare centres regarding effective biomedical waste management systems.

6.4: Research Limitations:
The results of the thesis may be limited to general information obtained by visiting each hospital of my research site. At every visit many problems comes across like unavailability of doctors and staffs workers, limited information provided during visits.