MODULE 4 – THE PRICE OF PANACEA – BIOMEDICAL WASTE

OBJECTIVES

By the end of this session the students shall be able to: -

1. Learn about what is biomedical waste?
2. How biomedical waste is generated?
3. Learn why biomedical waste is the most hazardous?
4. Know what is included in biomedical waste?
5. Learn how biomedical waste can be properly disposed off by various techniques such as incineration, autoclaving and dichlorination etc?

SUMMARY

Biomedical waste in hospitals and nursing homes includes placentas, used needles, Syringes, Pathogenic organs removed after operations, pus and blood saturated cotton pads and bandages, drip equipment and empty bottles as solid waste. Liquid waste includes HIV or Hepatitis B infected blood.

This module shows how these hazardous wastes can be safely disposed off. Techniques like incineration, autoclaving, hydroclaving, and microwave methods have been revealed with proper visuals.

It has also been pointed out that disposal of bio-medical waste is the most important job but it is performed by class four employees or housekeeping staff who are sometimes illiterate therefore proper posters or coloured containers are used to separate biomedical waste and dispose it off.

TRANSCRIPTION

INTRODUCTION:

We are living in an age of hi-tech industrialization, where all material comfort can be acquired through a mere click of the mouse. Thanks to economic liberalization and the crumbling walls of protectionist policies of governments - the world has shrunk. This has been achieved through advanced means of communication, like the Internet and also by pursuing policies of integration with the international community, which has very aptly been named as globalization. In the field of scientific research and development also, the progress has been phenomenal. New drugs have been formulated, diseases earlier considered incurable can now be treated and some have all together been eradicated.

But all this has not been achieved free of cost. As we know, there is always a

flip side of the coin. And the bane of all the advancement that mankind has made in numerous fields, has been the irreparable loss caused to the environment due to pollution. Pollutants in the form of gases, smoke, liquids & solid matter are being generated in millions of tons round the clock which is damaging the atmosphere causing in global warming, polluted water and toxic top soil.

One such source of potential threat to the environment, & indeed to our very existence is Bio Medical Waste. Bio Medical Waste is generated primarily during the diagnosis, treatment or immunization of human beings or animals from health care establishment and also institutions such as blood banks, laboratories, pharmaceutical industries and research institutes. Have you ever wondered, where the pathological wastes, radioactive waste, chemical waste, pharmaceutical wastes goes or is disposed off by these institutions? We just get admitted into these institutes for our treatment or investigations, avail of the facilities and get discharged without knowing the fact as to how harmful or infectious these bio medical wastes can be if not properly disposed off.

LEGAL ACTS:

After forming a vague picture of BMW and what it is about, it is necessary to have an idea about the Bio Medical Waste (Management and Handling) Rules 1998 & 2000.

Ministry of Environment and forest, Govt. of India formulated the biomedical waste management and handling rules in the year 1998. Thereafter it has been amended in year 2000 and as per the rules, they have made 5 schedules. One has to take care of all these schedule while treating the bio-medical waste.

These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose off or handle BMW in any form.

Under the Environmental protection act 1968, whoever do not comply with the provision of this rule can be fine of rupees up to 1 lakh or the imprisonment of 5 years or a penalty of rupees 5000/- per day for the duration of non-compliance or all this three can be put in together also.

After listening to the laws and the nitty-gritty's, which are involved in the management of BM, one can, realize how serious the matter is. Now the question, which arises as a natural consequence is-whether these laws, norms and protocols that have been regulated, are being adhered to or not. Because simply forming the laws is not going to solve our problem, which has far reaching consequences.

BIO MEDICAL WASTE AND HEALTH HAZARDS:

Bio medical waste management is a special case for management of wastes, which are hazardous not just for the generators and operators, but also affect the

general community. Another important group affected by BMW is the rag pickers who are not able to distinguish the general waste from BMW.

90 % of the biomedical waste which is generated in India in disposed with the municipal waste. It is going to the trenching ground, it containing Bactria's, it containing pathogens and it is coming back to our society.

Unless sufficient care is taken to neutralize the toxicity and make the waste productive, communicable diseases are likely to spread especially in an urban environment where the density of population is high. So, it is mandatory for us to understand the different levels through which the BMW passes and what precautions are needed at each of these levels.

Segregation is the success of any disposal of waste and in the gazette notification it is clearly mentioned that segregation should be done at source by the institutions, by the hospitals, nursing homes or the clinic.

DISPOSAL OF BIOMEDICAL WASTE

Different categories of segregated wastes need to be collected in color-coded containers as prescribed in the BMW (Management and Handling) Rules, 2000.

Segregation on the part of incinerable and non- incinerable waste, like all the incinerable waste which contains the blood sore part, gauze pieces, cottons, that are to be segregated in yellow bags or red bags and plastic, glass, metals sharps are to be segregated separately, so that they are having different principle of treatment and it is easy for a common biomedical waste facility operator to treat these waste at site.

Sharp objects must always be kept in puncture proof container to avoid injuries to the workers handling them as any cut in the skin of a handler provides a direct route for pathogens to enter the blood. Plastic bags for storing the waste must be placed inside a container and a lid should be provided to cover the opening of the bag. The storage time for each category of waste generated should be determined; wastes such as placenta, which cannot be stored for long durations, should be collected early. Ideally, waste should be collected at least twice a day. And above all handlers or staff members should be equipped with protective clothing such as goggles, masks, boots, aprons and gloves to manage these activities.

Some pre-treatment should be carried out at the point of waste generation. Syringes & needles should be crushed before putting them into the containers so that rag pickers are discouraged from collecting them for resale. This also saves the needles from getting recycled at a later stage. Sharp objects should be disinfected at source using chemical disinfectants. Laboratory waste and highly infectious waste such as body parts with gangrene or HIV-infected blood should be pre-treated and

disposed off immediately.

Medicines which are used in the operation theaters and the discarded medicine and the expiry medicines, all these medicines they should be collected in the separate containers and these medicines should not be mixed with any other waste which is generated either in the hospital or in the labour room or any other department. These medicines they should be collected separately and they should be disposed off separately. They should not be mixed with anatomical waste or the operation waste of the infectious waste.

Internal transportation of toxic waste and non-toxic waste is an important aspect and must be considered very seriously. This is to be done properly in labeled trolleys/boxed carts. The segregated waste should always be collected and transported separately. Mixing the segregated waste should be strictly prohibited and special care must be taken for the routine cleaning and disinfecting of these trolleys to minimize the spread of infections.

The waste which is transported to the collection point, ready to be transported elsewhere, must also undergo treatment. This stage of BMW management is called post-treatment. At this stage, a particular segregated waste is given suitable disposal treatment before being finally disposed off. For instance, segregated waste, which is to be sent to the common incinerator plant, should be first dipped in hypo chlorine solution before it is kept in transporting vehicles.

Let us see what are the various/common methods used for disposal of different segregated waste.

For example – Needle-cutters and Syringe-crushers are used to destroy the syringe and other sharp objects used in various centers. Shredders are used to destroy plastic and paper waste to prevent their reuse.

Historically, incinerators have been the most common method used by health care facilities in India and is appropriate for pathological waste, anatomical and non-anatomical biomedical waste. An incinerator carries out complete combustion of carbon-containing compounds in the presence of fuel and air. The fuel provides heat energy to attain incineration temperature and air provides oxygen for combustion. The key parameter in an incinerator is the combustion chamber temperature which should be maintained around 1200^0C and if the requisite temperature is not ensured, incomplete combustion can result in formation of gases such as dioxins and furans, which are much more detrimental than the initial waste. Incineration is effective when the waste is combustible, because it is a process where the combustible waste is reduced to exhaust gaseous products and to ash, which is acceptable at the local municipal waste site.

The incinerator ash comes under the hazardous category and it should be disposed off in a secured landfill. If secured landfill is not available in the city the

common biomedical waste treatment facilitator has to develop his own secured landfill for disposal of ash. New technologies are coming for the disposal of waste and now a day's autoclave is being used at many places for disposal of biomedical waste.

The process is an appropriate technology for the treatment of microbiology laboratory waste, human blood and body fluid waste, waste sharps and non-anatomical waste.

The hydroclave is an innovative combination of waste sterilization, which is similar to autoclave waste fragmentation & dehydration.

Microwave disinfections technology is relatively advanced & the latest in the field of medical waste management. The process uses microwaves radiation to heat & destroy microorganism.

Microwave, when installed in India was not successful because the proper segregation of waste was not there and the metal parts coming with the biomedical waste, they damage the machine but in western countries where segregation is being done properly, microwave has been a very useful equipment.

The generators and operators of BMW often face the problem of selecting the right technology for treatment and disposal and also, no single technology is ideal for all kinds of BMW and all scales of operation. In some situation it may be advantageous to use more than one treatment or technology for the waste generated in an institution.

IMPORTANT PRECAUTIONS:

Special care should be taken at the time of external transportation so that BMW is not mixed up with other waste, and no untreated BMW is kept or stored beyond a period of 48 hours, and if a container is to be transported from the premises where BMW is generated to any common treatment facility, then these containers should be kept labeled and away labeled from other containers, and this untreated BMW should be transported only in such vehicles as may be authorized for the such purposes. The municipal body of the area should continue to pickup and transport segregated non-BMW generated in any institute, as well as duly treated BMW for being transported to the municipal dump site.

In the final disposal stage, care should be taken to reduce the waste as much as possible because only small amount of BMW is infectious and other waste such as general waste can be recycled or converted into manure if properly treated. Only hazardous substances such as treated ash from incinerators should be disposed off after retrieving the recyclable portion.

Now by a law everybody talks about solid waste and more often we forget about the liquid waste. for example, may be any patient coming to hospital, he may be HIV+, he may be suffering from Hepatitis B, we don't know by looking at the patient and if you collect the sample of the person, that sample is going to have the viruses of that particular disease. Same way the hospital with the liquid waste, the effluent is likely to have large number of bacteria which will be pathogenic, it will also have the viruses. If these are transported through the sewage to the community. It is really a great hazard for the community.

The liquid waste should also be dichlorinated before letting it into septic tank.

Or if possible a proper Effluent treatment plant (ETP) should be installed in the concerned institution, as it not only prevents the spread of water borne diseases like dengue, diaorhea, but also treats the water which can be used for cleaning and gardening.

Every hospital and such institutions has to treat the water which will be safe. The question come that the how many hospitals will be having such facility. That's true but more and more hospitals now should try to use systems of the water that they are going to put it in the municipal sewage system is going to pure, safe and again it can be used for other purposes.

The sludge dried by sunlight can act as a source of good manure too, if the sludge parameters are well within the prescribed limits.

AWARENESS REGARDING BIOMEDICAL WASTE:

After equipping you with the information about BMW management, there is a great need to understand the fact that, the role of nurses and paramedical staff is pivotal in managing it. Therefore, education and training of nurses becomes one of the primary steps in managing BMW.

We have taken things it to consideration like first of all we have prepared some posters, which indicates what colour coding we are going to carry out and in those colour coding what things are to be disposed. We have prepared a poster in a language which is easily understood by the housekeeping staff because they are the main workers who are dealing with this waste. Even if there are some workers are not able to read these posters then we have picturise those posters in a way that if a yellow container has been shown then we have shown the human body organ. So that even a housekeeping worker does not understand I mean he cannot read the language. He will understand that what to through in that dustbin.

So every institution should conduct regular `in-service' education programs for nurses and health care workers to keep them abreast of the new trends in infection control and managing waste.

The management of bio-medical waste is still in its infancy all over the world. There is a lot of confusion in the minds of generators community which may be due to many reason the reason may be lack of awareness and lackadaisical attitude in adhering to the laid down norms and regulation or simply a general carelessness by all concerned.

Now there is no single magic formula, which can solve this problem. The regulation has to be by share responsibility by all of us. Firstly by all the generator community who must realize the deadly consequence that can be infected on the society, if the waste that are being generated or not disposed off properly. Secondly by the low enforcing agencies that are responsible for ensuring that all laid down lows and protocols are being properly adhered too and if they are not the wrong doers are punished and last but not the least people like you and me. The users of this facility who are generating these wastes. Only when a joint effort by all of us concerned is made only then. We can hope for a cleaner environment and a better earth for people like us and our feature generations to live in and, since a beginning have to be made some way. Why shouldn't we start today itself.

GLOSSARY

1.	Biomedical waste	:	Waste generated during the treatment of living being.
2.	Globalization	:	At international level
3.	Eradicated	:	Destroyed
4.	Flip side of the coin	:	Tail side of the coin
5.	Bane	:	Curse
6.	Toxic	:	Poisonous
7.	Pathological	:	Diseases causing
8.	Dispose off	:	Destroy
9.	Nitty-gritty	:	Practical details of a matter
10.	Hazardous	:	Risky
11.	Trenching ground	:	Ground outside residential area where waste is buried in pits.

12.	Segregation	:	Separation
13.	Placenta	:	Spongy organ nourishing the fetus in mammals & expelled after the birth of the child.
14.	Shredder	:	Cutter
15.	Incinerator	:	Device to burn waste at high temperature in a closed chamber.
16.	Autoclave	:	Pressure cooker like apparatus working at high temperature and pressure.
17.	Hydroclave	:	Type of autoclave involving the hydration.
18.	Effluent	:	Flowing out
19.	Infancy	:	Early stage

F.A.Qs.

Q1. What is biomedical waste?
Ans. The waste generated in hospitals & nursing homes during diagnosis, surgery and immunization of human beings and animals.

Q2. List some organizations contributing towards biomedical waste.
Ans.
1. Hospitals and nursing homes.
2. Blood banks.
3. Pathology laboratories.
4. Pharmaceutical industries.
5. Research institutes.

Q3. List some solid biomedical waste.
Ans.
1. Used needles, syringes, empty injection, vials, empty drip bottles.
2. Pus & blood containing cotton pads and bandage.
3. Disposable surgery equipment.

Q4. List some liquid biomedical waste.
Ans.
1. HIV infected blood samples.
2. Hepatitis B infected blood samples.
3. Infected saline, infected dextrose.

Q5. Why biomedical waste is considered to be the most hazardous?

Ans. Because it contains germs of diseases like T.B., AIDS, Hepatitis B and most of the infectious diseases.

Q6. How biomedical waste is generated?
Ans. During diagnosis, surgery, treatment and vaccination or immunization from pathology laboratories and research institutes.

Q7. In which year biomedical waste (Management & handling) rules were passed in India?
Ans. In 1998 and amended in 2000.

Q8. To whom these rules are applicable?
Ans. The rules apply to the person or organization which generate, collect, receive, store, transport, treat, handle or dispose off biomedical waste.

Q9. Which department has formed these rules?
Ans. Ministry of Environment and forest, Govt. of India.

Q10. What is the quantum of punishment if these rules are not followed?
Ans. A fine up to Rs. 1 Lakh or imprisonment of 5 years or penalty of Rs. 5000/- per day for the duration of non compliance or all simultaneously.

Q11. How biomedical waste is generally disposed off?
Ans. Along with municipal waste it is buried in trenching grounds. This practice is harmful as pathogenic bacteria can cause infection to the residents of nearby area.

Q12. What is first step during the disposal of biomedical waste?
Ans. Separation into combustible and non combustible parts.

Q13. What is an Incinerator?
Ans. Device to burn at high temperature in a closed chamber. So that toxic do not diffuse out.

Q14. Which biomedical wastes are subjected to incineration?
Ans. Blood soaked cotton pads, bandages full of pus.

Q15. What is the colour of bag in which the waste requiring incineration is to be separated?
Ans. Yellow or Red.

Q16. What is the dress code for the person handling biomedical waste?
Ans. Apron, goggles, Mask, boots and gloves.

Q17. How sharp objects like needle syringes are to be disposed off?
Ans. By crushing and segregating them in puncture proof containers to avoid injuries

to workers handling them.

Q18. What chemical is used for the pretreatment of the waste to be incinerated?
Ans. Hypochlorine.

Q19. What should be the temperature of incinerator for complete combustion of biomedical waste?
Ans. 1200^0C.

Q20. How the ash left in the incinerator is disposed off?
Ans. By secure Landfill method in deserted area considerably away from residential area.

Q21. Along with incinerator what are the other equipment to dispose off biomedical waste?
Ans. 1. Autoclave
2. Hydroclave
3. Microwave

Q22. For how much duration can untreated biomedical waste be retained by a hospital?
Ans. 48 Hours.

Q23. Which biomedical waste cannot be retained beyond 24 hours?
Ans. Placenta.

Q24. Role of which employees is important in the safe disposal of biomedical waste?
Ans. Nurses and Paramedical staff.

Q25. How an illiterate worker can be trained for proper segregation of biomedical waste?
Ans. By illustrating the containers and also by using different coloured containers for different disposables.

CASE STUDY

The city of Indore in Madhya Pradesh has several government and private hospitals as well as nursing homes which produce huge quantities of biomedical waste The Maharaja Yashwant Rao Govt. Hospital and T. B. hospital are situated in the heart of the city. The officers of pollution control board insisted on proper disposal of biomedical waste. The result was that the hospital had to install its own incinerator.

As the Choithram Hospital & Research Centre, Indore has an incinerator having greater capacity than its own requirement, it extends this facility to other hospitals and nursing homes by charging proper amount from them. For this

purpose hospital has a separate vehicle with containers to transport the waste to the incineration site.