ejpmr, 2021,8(9), 538-542

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

BACTERIOLOGICAL PROFILE OF BIOMEDICAL WASTE

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Article Received on 10/07/2021 **Article Revised on 31/07/2021** **Article Accepted on 20/08/2021**

ABSTRACT

Bio Medical waste (BMW) can be generated in hospitals, clinics and places where diagnosis and treatment are conducted. The management of these wastes is an issue of great concern and importance in view of potential public health risks associated with such wastes. Biomedical waste management is receiving greater attention due to recent regulations of the Biomedical Wastes (Management & Handling Rules, 1998) & Bio-Medical Waste Management (Amendment) Rules, 2019. Inadequate management of biomedical waste can be associated with risks to healthcare workers, patients, communities and their environment. The present study which was carried at the Govt. Medical College (GMC) Srinagar Associated hospitals with the aim to find out bacteriological profile of BMW. Total 300 cases of biomedical waste samples were taken in the study for bacterial culture, 117 samples of biomedical waste showed growth of bacterias. Pseudomonas species was the predominant bacteria isolated from this culture.

KEYWORDS: Biomedical Waste, Bacteriological Profile, Management.

INTRODUCTION

Good medical care is vital for life, health and general well-being and hospitals are health institutions that provide these services. Wastes generated from the hospitals, health care centres, medical research institutions, blood banks, medical laboratories, etc. usually include sharps, human tissue or body parts and other infectious materials and is referred to as "Health care waste", "Hospitals solid waste", and or "Biomedical solid waste".

While waste management has become a critical issue which has taken a central place in the national health policies of developed nations and is attracting considerable interest, in most developing countries like Nigeria, the handling and treatment of municipal solid waste (MSW) or domestic waste have not received sufficient attention. In most developing countries like Nigeria, the management, treatment, and handling of medical waste is often very poor as medical wastes are still handled and disposed together with municipal solid waste into landfills and/or open municipal dumpsites at various locations within the cities. Yet only about 75-90% of the waste is non-risk while the remaining 10-25% of medical waste is hazardous, creating a variety of health risk for the municipal workers, the general public and the environment, because of the presence of infections biological, hazardous and radio-active waste materials.

In Nigeria, for example, this unwholesome medical waste disposal practices may be attributed to ignorance, lack of awareness of the potential dangers this poses to the health of the people and the environment, including ground water, the high cost of effective and efficient management and handling of the waste by the authorities concerned, lack of strict laws and policies or enforcement of the laws governing the disposal of the medical waste by government agencies. It is dangerous due to its high harmful potential, not only for people, but also for the environment, if it is not properly managed. For this reason, medical waste sterilization is an important process to eliminate risks associated with handling and transport. This important advancement moreover provides a guarantee to hospital administrations that are responsible for such waste for as long as it presents a danger.

Biomedical waste can be classified into four big categories: clinical waste, laboratory waste, non- clinical waste and kitchen waste. Infectious or hazardous hospital waste represents only a small part of the total medical waste; yet, because of ethical questions and potential health risks, it is a focal point of public interest. Most hazardous and toxic waste is coming from clinics and hospitals. Only a small amount is from domestic or industrial sources. Among all these types, the first two categories at least should represent a serious concern for everyone who is implicated in healthcare activities. For this reason, all medical units should have proper medical waste treatment equipment. If not, all kind of accidents can happen and healthy people can become ill, just because they were not careful enough and they mishandled medical wastes. In this way, infections and

pollutants can spread easily and affect a large number of people.

In the 1980s and 1990s, concerns about exposure to HIV and Hepatitis B Virus (HBV) led to questions about potential risks inherent in medical waste. Thus hospital waste generation has become a prime concern due to its multidimensional ramifications as a risk factor to the health of patients, hospital staff and extending beyond the boundaries of the medical establishment to the general population. Hospital waste management has been brought into focus in India recently, particularly with the notification of the BMW Rules, 1998, makes it mandatory for the health care establishments to segregate, disinfect and dispose their waste in an eco-friendly manner. The issue of indiscriminate BMW management in India has attracted the attention of the highest judicial body at the level of Hon'ble Supreme Court of India, from time to time issued instructions regarding management of Bio-Medical Waste. In persuasion to the directive of the Court, the Ministry of Environment and Forests, Government of India notified the Bio-Medical Waste (Management and Handling) Rules on 27th July 1998; accordingly all the hospitals in the public and private sector are now bound to follow these rules to evade legal actions.

MATERIAL AND METHODS

In the present study, bacteriological profile of the samples like pus from used dressing material, IVline, catheters are some of the biomedical waste material from patients admitted in the different wards of Govt. Medical College (GMC) Srinagar Associated hospitals was studied. The 300 bacterial isolates from patients admitted in ICU, Gynecology & Obstetric, Surgery, Orthopaedics etc. were taken in account. The samples taken for study were transported immediately to the Microbiology Laboratory for culture of the sample on routine culture media and incubation at 37°C for overnight. Any micro organism grown on culture was also taken in account of bacteriological profile of biomedical waste.

Bacterial Analysis of Bio Medical Waste

For bacteriological study, Sample was transferred into the respective colour coded leak proof bags. The bags were sealed tightly and taken to microbiology laboratory. For differentiation of different types of bacteria, High Media (MacConkey) Broth culture medium was used.

The constituents were as follows

Proteose peptone	3.0 grams.
Peptone	17 grams
Lactose gram	10.0 gram
Bile salt mixture No.3	1.5 gram
Sodium chloride	5.0 gram
Neutral red	0.03 gram
Crystal violet	0.001 gram

2.8 gram of McConkey Broth was dissolved in 100 ml distilled water and pH was adjusted to 7.1. The medium was inoculated and incubated for 24 hours at 37 ºC.

Following biochemical tests were performed for the confirmation of bacteria

Indole test:- 0.3 ml Kovacs reagent was added on broth.
Methyl red test:- 5 drops of methyl red solution were added on broth.
Nitrate test:- Solution A-sulphanilic acid in acetic acid and solution B- alpha naphthylamine in acetic acid were added on nitrate broth.
The data collected was subjected to statistical analysis for presentation in the form of table-1.

RESULTS AND DISCUSSION

Total 117 cases shows isolates of bacterias from biomedical waste culture, out of these 37 (31.62 %) isolates were of Pseudomonas sp., 28 (23.93 %) cases of Escherichia coli, 21 (17.94 %) cases of Staphylococcus aureus, 14 (11.96 %) cases of coagulase negative Staphylococcus, 09 (7.69 %) cases of Klebsiella sp.,04 (3.41 %) cases of Proteus vulgaris, 03 (2.56%) cases of Enterococci, 01(0.85%) cases of Citrobacter species(Table:-1).

Bacteria isolated from biomedical waste also included resistant strains of variety of bacterias. It is required that bacterias isolated should be disposed of properly to prevent spread of infection in other patients and community.

Prospective inference of Biomedical Waste

Disposal of this waste is an environmental concern, as many medical wastes are classified as infectious or biohazardous and could potentially lead to the spread of infectious disease. The most common danger for humans is the infection which also affects other living organisms in the region. Daily exposure to the wastes (landfills) leads to accumulation of harmful substances or microbes in the person's body. Physical (injury) and health hazards are also associated with the high operating temperatures of incinerators and steam sterilizers and with toxic gases vented into the atmosphere after waste treatment. There may be increased risk of nosocomial infections in patients due to poor waste management. Improper waste management can lead to change in Bacteriological ecology and spread of antibiotic resistance.

A 1990 report by the United States Agency for Toxic Substances and Disease Registry concluded that the general public is not likely to be adversely affected by biomedical waste generated in the traditional healthcare setting. They found, however, that biomedical waste from those settings may pose an injury and exposure risks via occupational contact with medical waste for doctors, nurses, and janitorial, laundry and refuse workers. Further, there are opportunities for the general public to come into contact medical waste, such as needles used illicitly outside healthcare settings, or biomedical waste generated via home health care.

Non-Hazardous Waste: This constitutes about 85% of the waste generated in most healthcare set-ups. This includes waste comprising of food remnants, fruit peels, wash water, paper cartons, packaging material etc.

Provisions of the Law: Safe disposal of biomedical waste is now a legal requirement in India. In accordance with BMW Management and Handling rules, it is the duty of every "occupier" i.e. a person who has the control over the institution or its premises, to take all steps to ensure that waste generated is handled without any adverse effect to human health and environment. The hospitals, nursing homes, clinics, dispensaries, pathological laboratories etc., are therefore required to set in place the biological waste treatment facilities.

It is however not incumbent that every institution has to have its own waste treatment facility. The rule also envisages that common facility or any other facilities can be used for waste treatment. However it is incumbent on the occupier to ensure that the waste is treated within a period of 48 hours. These rules have six schedules as briefed in Table: 2.

Hazardous Waste

Potentially Infectious Waste: Over the years different terms for infectious waste have been used in the scientific literature, in regulation and in the guidance manuals and standards. These include infectious, infective, medical, biomedical, hazardous, red bag, contaminated, medical infectious and regulated medical waste. All these terms indicate basically the same type of waste, although the terms used in regulations are usually defined more specifically. It constitutes 10% of the total waste which includes:

1. Dressings and swabs contaminated with blood, pus and body fluids.
2. Laboratory waste including laboratory culture stocks of infectious agents.
3. Potentially infected material: Excised tumours and organs, placenta removed during surgery, extracted teeth etc.
4. Potentially infected animals used in diagnostic and research studies.
5. Sharps, which include needle, syringes, blades etc.
6. Blood and blood products. (Table: 3, 4)

CONCLUSION

Considering the growing scale of biomedical waste generated in Srinagar. It is imperative to take this issue at top most priority basis. Adequate biomedical waste management is the solution to safeguard city environment and provide a healthy, hygienic living environments for the city dwellers. So in order to prevent super spread of bacterial infection, following steps should be taken while handling the bio medical waste:-

1. Washing of hands with soap and warm water after handling BMW. Also, washing of all areas of body with soap and water that you may have come into contact with biomedical waste, even if we are not sure that body actually touched the biomedical waste.
2. Keeping all sores and cuts covered. Immediately replace wet bandages with clean, dry bandages.
3. Wear disposable latex gloves when handling BMW. Discard the gloves immediately after use.
4. Wear an apron or another type of cover to protect clothes from contact with the waste. If clothes become soiled, put on fresh clothes, and take a shower, if possible. Launder or throw away clothes soiled with biomedical waste.
5. Promptly clean and disinfect soiled, hard- surfaced floors by using a germicidal or bleach solution and mopping up with paper towels.
6. Clean soiled carpets. First blot up as much of the spill as possible with paper towels and put the soiled paper towels in a plastic lined, leak-proof container. Then try one of the following: Steams clean the carpet with an extraction method. Scrub the carpet with germicidal rug shampoo and a brush. Let the carpet dry, and then vacuum it.
7. Never handle syringes, needles, or lancets with hands. Use a towel, shovel, and/or broom and a dustpan to pick up these sharp objects. Dispose of them in a plastic soda pop bottle with a cap. Tape down the bottle cap. Then throw the bottle in the trash.

Table 1: Bacteriological Profile of Biomedical Waste.

Bacteriological Profile	No. of cases (%) (n=117)
Coagulase negative staphylococci	14 (11.96)
Enterocooci	03 (2.56)
Escherichia coli	28 (23.93)
Staphylococcus aureus	21(17.94)
Klebsiella sp.	09 (7.69)
Pseudomonas sp.	37 (31.62)
Proteus Vulgaris	04 (3.41)
Citrobacter sp.	01 (0.85)

Table 2:

Schedule	Contents
Schedule I	Classification of biological waste in various categories (Table 3).
Schedule II	Color coding and types of containers to be used for each category of biomedical waste (Table 4)
Schedule III	Proforma of the label to be used on container / bag
Schedule IV	Proforma of the label for transport of waste container / bag
Schedule V	Standards for treatment and disposal of wastes
Schedule VI	Deadline for creation of waste treatment facilities

Table 3: Categories of Biomedical Wastes & Methods of their Disposal.

Category	Waste Type	Treatment and Disposal Method
Category 1	Human Wastes (Tissues, organs, body parts	Incineration @/ deep burial *
Category 2	Animal Waste	Incineration @/ deep burial *
Category 3	Microbiology and Biotechnology waste	Autoclave/microwave/incineration@
Category 4	Sharps	Disinfection (chemical treatment)+/autoclaving/microwaving and mutilation shredding**
Category 5	Discarded Medicines and Cytotoxic Drugs	Incineration@/ destruction and drugs disposal in secured landfills
Category 6	Contaminated solid waste	Incineration@/autoclaving / microwaving
Category 7	Solid waste (disposable items other than sharps)	Disinfection by chemical treatment+ microwaving/autoclaving & mutilation shredding*
Category 8	Liquid waste (generated from laboratory washing, cleaning, housekeeping and disiunfecting activity)	Disinfection by chemical treatment+ and discharge into the drains
Category 9	Incineration ash	Disposal in municipal landfill
Category 10	Chemical Wastes	Chemical Treatment + and discharge in to drain for liquids and secured landfill for solids

@ There will be no chemical treatment before incineration. Chlorinated plastic shall not be incinerated.
* Deep burial shall be an option available only in towns with population less than 5 lakhs and in rural areas.
+ Chemical treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.
** Mutilation/shredding must be such, so as to prevent unauthorized reuse.

Table 4: Colour Coding of Bags of Waste Management System.

Color coding	Type of container to be used	Waste Category Number	Treatment options as per schedule I
Yellow	Non- chlorinated plastic bags / puncture proof container	Category 1,2,5,6	Incineration
Red	Non- chlorinated plastic bags / puncture proof container for sharps	Category 3, 4, 7 (4- waste sharps) (In the earlier Rules, Soiled wastes)	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

ACKNOWLEDGEMENTS
The authors thank all the staff of the surveyed hospitals for their immense support during the study.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest

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