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A STUDY ON KNOWLEDGE, ATTITUDE AND PRACTICES OF BIOMEDICAL WASTE MANAGEMENT IN DIAGNOSTIC HEALTHCARE CENTRES IN WEST BENGAL.

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Abstract

Background: Biomedical waste (BMW) generated during diagnosis and treatment poses severe threats to the environment and healthcare personnel, including the transmission of diseases like HIV and Hepatitis. While India has established laws for BMW management, implementation and awareness remain unsatisfactory, particularly in the rapidly growing sector of smaller diagnostic facilities.

Objectives: This study aimed to assess the Knowledge, Attitude, and Practices (KAP) regarding biomedical waste management, legislation, and safety among healthcare personnel in private diagnostic centres.

Methods: A cross-sectional study was conducted over two months at three leading private diagnostic centres in West Midnapore, West Bengal. The study population consisted of 270 voluntary participants, comprising 45 doctors, 156 laboratory technicians, 30 laboratory attendants, and 39 general duty attendants. A pre-tested, structured questionnaire containing 30 questions (divided equally into knowledge, attitude, and practice domains) was used for data collection.

Results: Knowledge regarding BMW legislation was found to be "good" in only 53.33% of doctors and 50% of technicians, while attendants and general duty staff scored significantly lower. Regarding attitude, 50% of the total participants considered BMW management an "extra burden" on their work. While doctors (30/45) and technicians (90/156) demonstrated "good" practice awareness, lower-tier staff fared poorly. Notably, 70% of all participants had poor awareness regarding post-exposure prophylaxis.

Conclusion: The study reveals a critical gap in knowledge and awareness among healthcare personnel, including doctors and technical staff. Strict implementation of regulations, regular intensive training programs, and the involvement of top management are recommended to improve waste management practices and ensure occupational safety.

Keywords: Biomedical Waste Management, KAP Study, Diagnostic Centres, West Bengal, Healthcare Personnel.

Introduction

The term "biomedical waste" has been defined as "any waste that is generated during diagnosis, treatment or immunisation of human beings or animals, or in the research activities pertaining to or in the production or testing of biologicals and includes categories mentioned in schedule I of the Government of India's Biomedical Waste (Management and Handling) Rules 1998". The Government of India (notification, 1998) specifies that Hospital Waste Management is a part of hospital hygiene and maintenance activities.[1,2] The term Biomedical waste in India encompasses variety of wastes generated in healthcare setting. These include slides, tissues, tubes, syringes, swabs, gauzes, blood, body fluids etc. other wastes such as paper, packets, plastic, containers all are general wastes and they comprise of the majority of wastes generated in a health care setting.[3,4] Proper handling of biomedical wastes is of utmost importance as it can pose severe threat not only to the environment, but also to the healthcare personnel. Transmission of diseases like hepatitis, HIV are notable among these.[5] Though India has the laws, the implementation of it needs policies and enforcement.[6] Although there is increased global awareness among health care professionals about hazards and also appropriate management techniques, the level of awareness in India has been found to be unsatisfactory.[7, 8, 9] The healthcare management practices in developing countries like India are facing challenges of various aspects in developing countries. These include lack of awareness, lack of implementation, illegal recycling and so on.[10] Now a days, smaller healthcare centres and diagnostic facilities have come up in huge numbers in suburbs of India. These centres generate copious amounts of biomedical wastes. This study was undertaken to assess the knowledge attitude and practice of leading private diagnostic centres in a district of West Bengal.

Objectives

To determine the knowledge of existing policies regarding biomedical waste management, to determine the awareness towards BMW management and the practice of BMW management.

Literature review:

Several studies have been there previously regarding the BMW management. Mathur et al in their review article have stressed upon the need for awareness among the personnel involved in generation and disposal.[11] Joseph et al conducted a 3 yr study to assess the impact of training, audits and education/implementations on awareness and practice of biomedical waste segregation. Their study reveals focused training, strict supervision, daily surveillance, audits inspections, involvement of hospital administrators and regular appraisals are essential to optimise the segregation of biomedical waste.[12] In a study by Harsh G Shah et al, which comprised of interns, graduates and postgraduates of private dental colleges of Ahmedabad, it was found that the knowledge was consistent but attitude varied a little. [13] There was a study by Joshi et al in a rural tertiary care hospital where they assessed the staff perception on healthcare waste management. They found that there was a gap between knowledge and actual practice of healthcare waste management. [14]

In a study by Pandey V et al, in Lucknow, BMW management and its awareness was assessed among dental surgeons and results showed 59.76% of them were aware about BMW management. This showed only moderate level of awareness. [15] The review article by Priya Datta et al regarding BMW rules 2016 in India, suggests that for effective disposal of BMWM, there should be a collective

teamwork with committed government support in terms of finance and infrastructure development, dedicated health-care workers and health-care facilities, continuous monitoring of BMW practices, tough legislature, and strong regulatory bodies. They observed that the basic principle of BMWM is segregation at source and waste reduction. The authors also stressed upon the need for development of environment friendly medical devices and BMW disposal systems.[16] Changlai et al also studied the biomedical waste management in the city of Guwahati, a city of eastern India closer to our place of study.[17] In a recently published article on analysis of the Knowledge, Attitude and Practice of biomedical waste management and bio-safety among health care workers in a tertiary care hospital in Western India, by Mehta et al, the authors concluded that Intensive training programs at regular intervals are essential with special focus on nurses and first year resident doctors.[18] All these articles and studies provided the background knowledge and helped us to proceed with the current study.

Methodology :

The study population comprised of healthcare personnel from three leading diagnostic centres which caters the maximum pool of patients in the West Midnapore district of West Bengal. The study was undertaken over a period of two months after requisite approvals and permissions. A total of 270 participants took part in the study and all of them participated voluntarily. The population comprised of 45 doctors, 156 laboratory technicians, 30 laboratory attendants and 39 general duty attendants. A pre-designed, pre-tested, structured questionnaire consisting of 30 questions was used for data collection from all the study participants after getting their informed consent. All the participants returned the filled questionnaire form. English and vernacular languages were used for each questionnaire and confidentiality was assured.

The proforma contained the following 3 groups of questions, with 10 questions each-
1) knowledge of biomedical waste generation, segregation and the rules governing them
2) practices in BMW management
3) attitude towards BMW management
The answers were evaluated with a three tier marking-
Good – 7 or more out of 10
Average – 4-6
Poor – 4 or less
The percentage of correct and incorrect answers were noted and analysed.

4 **Results:**

Every participant of the total 270 taking part in the study completed the questionnaire and returned it. It was found that out of 45 doctors, 24 (53.33%) had good knowledge about biomedical waste generation and legislation. 78 of 156 technicians also showed a good knowledge. Among the attendants and general duty attendants, that number was considerably lower (9 of 30 and 12 of 39 respectively). (Table 1) 50% of the total participants considered the BMW management to be an extra burden of work. However, 44 % had a good attitude towards waste management. (Fig. 2) When it came to awareness of waste management practice, only 9 out of 39 general duty attendants had good practice awareness but 30 of 45 doctors had good practice awareness. 90 out of 156 technicians were well conversant. (Table 3)

Table1. table showing knowledge of biomedical laws in the staff

Category of staff	Good	Average	Poor
Doctors	24	21	0
Technicians	78	60	18
Attendants	9	6	15
Group D	12	6	21

Pie chart showing knowledge distribution

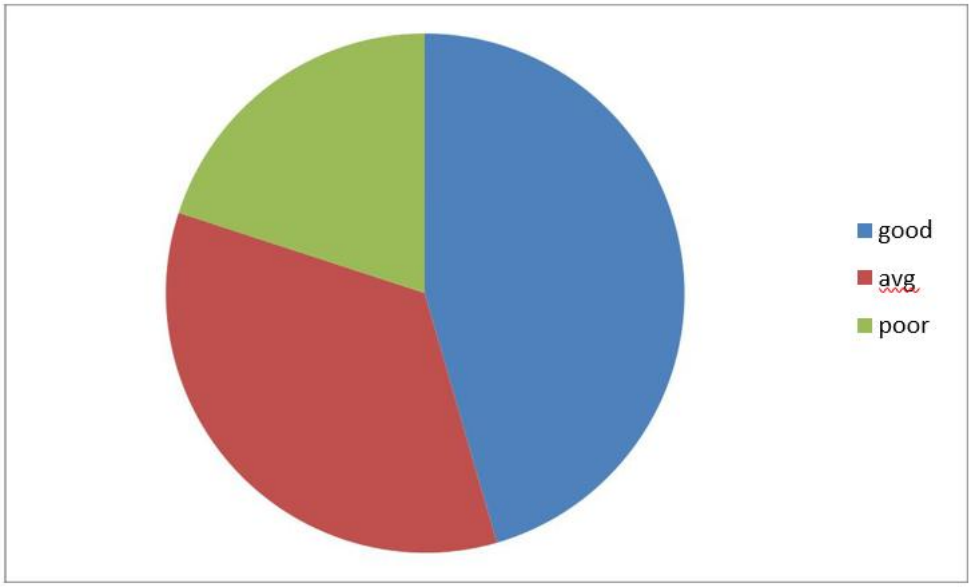


Table 2. table showing attitude of the staff towards biomedical waste management

Category of staff	Good	Average	Poor
Doctors	15	9	21
Technicians	84	15	57
Attendants	15	9	6
G D A	6	6	27

Pie chart showing attitude distribution

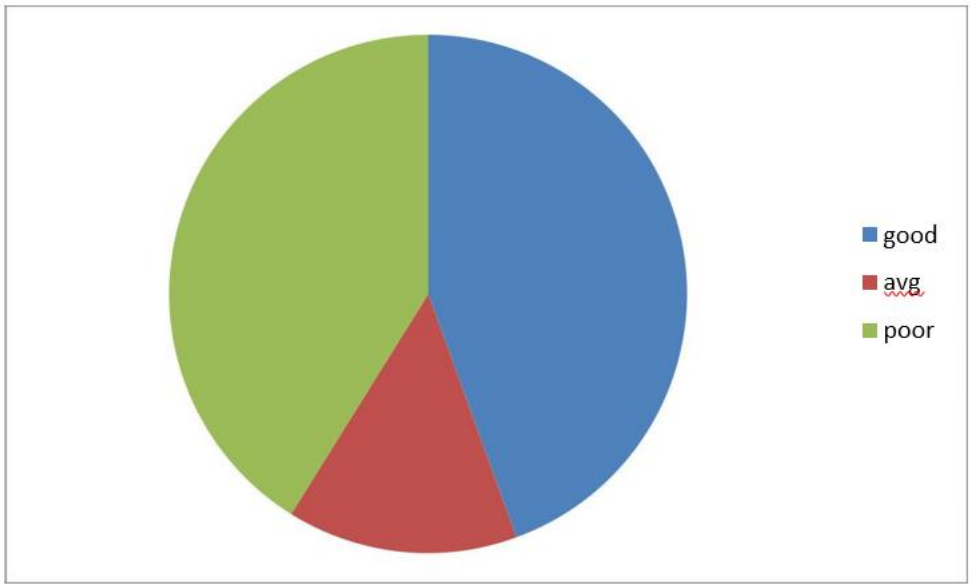
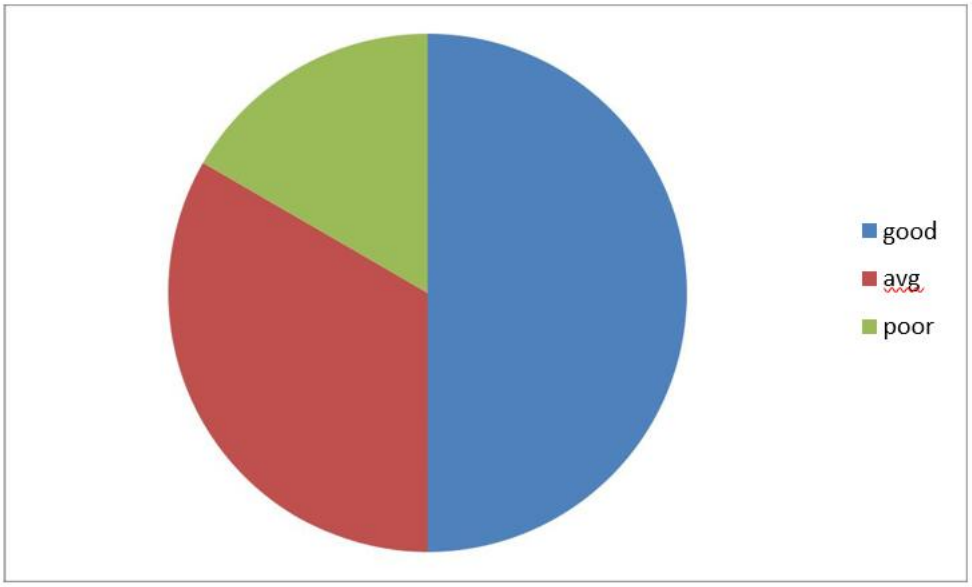


Table 3. table showing practice of biomedical waste management.

Category of staff	Good	Average	Poor
Doctors	30	15	0
Technicians	90	45	21
Attendants	6	21	3
G D A	9	9	21

Pie chart showing practice distribution



Discussion :

The present study was conducted in three major private diagnostic healthcare organisations, who catered almost 80% of all diagnostic patients in the West Midnapore district of West Bengal. The study population, comprising of doctors, laboratory technicians, attendants and general duty staff (housekeeping and maintenance), all worked in those organisations. It was helpful as the similar rules and protocols would be available to every participant. The questionnaire that was used comprised of mostly closed ended questions. Pretesting of the questionnaire enabled us to check for any irrelevant questions. Overall study showed that the awareness regarding biomedical waste management was poor and even among the doctors, the awareness was not up to the mark. The current study reflected a situation of the leading diagnostic centres of a populous district of West Bengal. A total 270 participants took part in the study and there was no drop out. The questionnaire had 10 questions for 3 sets each, pertaining to knowledge, attitude and practice respectively. There were 45 doctors in the organisation and all took part. It was shocking to see only 24 out of 45 had good knowledge of legislations. Doctors are considered to be at the top tier of a healthcare centre and a lack of knowledge among them would also reflect similar cases if not worse among the other healthcare personnel. This was the case for technicians and attendants. Only 50% of technicians had a good knowledge about BMW management. This was important because in a diagnostic centre, it is the technicians who generate a large amount of BMW through sample testing. A proper knowledge or the lack of it would certainly affect the overall BMW management of the centre. 9 out of 30 laboratory attendants showed good knowledge and 12 out of 39 general duty staffs showed good knowledge.

When it came to attitude, most of the technicians and attendants considered it an extra burden on the work. Some doctors also opined the same. Awareness questionnaire revealed that 15 of 45 doctors, 84 out of 156 technicians, 15 out of 30 attendants and 6 out of 39 housekeeping staff had good

awareness. But regarding post exposure prophylaxis, 70% of the participants had poor awareness. (189 of 270)

The knowledge about practice showed most doctors aware of the practices while the technicians were also somewhat conversant. The attendants fared average mostly.

The results of our study were similar to that of other studies in various parts of India. A study from Jaipur showed poor level of knowledge and awareness about BM waste generation hazards, legislation and management among health care personnel.[19] In a study of 2017 in Delhi, by Soyam et al the nursing staff showed the best knowledge and the authors opined that paramedics and other staff required considerable training in this regard.[20] Sudeep et al in a study from south India observed that there was lack of sufficient knowledge in health workers in the dental college and regular training was required.[4] Mehta et al found in a study at a hospital of western India that only 35.23% participants knew the waste storage time limit. Awareness about pre-treatment of the waste was found only in 5.8% nurses and awareness about post exposure prophylaxis was found in only 38% the authors found that knowledge and practices scores were better among technicians and doctors than nurses and trained participants had better attitude and practice scores compared to untrained ones. [18] In a study by Ramkrishna Mondal et al, it was found that nursing staff scored better than doctors in terms of knowledge attitude and practice. The authors also emphasised on regular training. [21] In a study by Pandey et al, among the interns in a tertiary care medical college of Maharashtra, only 68% had knowledge of segregation of waste but none had knowledge of correct colour coding. 88% answered that record maintenance was essential for biomedical waste management. However, 94% said that BMW is teamwork. [22] Chaudhuri et al, in West Bengal carried out a study regarding the waste management by sanitary workers in a tertiary care hospital. They found that most of the sanitary workers received no formal training before or after joining service (71.67%). Less than 60% of the sanitary workers knew about treatment of waste in hospital, diseases through waste and immunisation. 40.84% of them did not label the bags prior to waste collection and only 30% transported segregated waste in separate trollies.[23]

In a recent study by Anjuman Chowdhary, it was found that Awareness regarding bio-medical waste management rules was 67% in doctors, 60% in nurses, 57% among lab technicians, but the sanitary staff was not aware about this. Awareness about category of BMW, number, colour coding, disposed content, labelling and cover of waste containers and segregation of waste were more among nurses and lab technicians in comparison to doctors but minimum among sanitary staff. All the respondents (100%) doctors, nurses and lab technicians knew that HIV and Hepatitis B transmitted through Bio medical waste but their awareness regarding Hepatitis C and other diseases was very low. 74% of sanitary Staff did not know that these diseases could be transmitted through bio medical waste. [24] Kariwala P et al conducted a study among nursing staff in Uttar Pradesh. They found that , though the staff had reasonable knowledge and practice in other patient management skills, BMW management practice were poor. They also opined about regular training. [25]

Thus, we can see from the recent studies in various parts of India that the knowledge and awareness of the healthcare personnel is not good in most places. The technical staff have slightly better knowledge w.r.t the non-technical staff, but regular training and updating of knowledge is lacking. The situation is not too bright in other countries as well. A study by Mustafa Ali et al has stressed upon the fact that illegal recycling along with lack of proper awareness, lack of segregation practices was prevalent in developing countries. [10]

A descriptive cross-sectional study to assess the mechanisms and knowledge on BM waste management in five hospitals in Dakar, Senegal, reported that working conditions were deemed poor by 81.3% (n=61) of employees interviewed and personal protection equipment was available in only

45.3% (n=39) of services. Knowledge about BM waste management was deemed satisfactory by 62.6% (n=47) of interviewees and 80% (n=60) were aware of the health risks related to biomedical waste [26]. It was concluded that poor management of BM waste was a reality in hospital facilities in Dakar. The authors emphasised the need for increasing the awareness of managers for effective application of the legislation, implementing realistic management programmes and providing the appropriate on-the-job training to staff members. An Iranian survey performed on the collection and disposal of waste in the university hospitals of the Fars province found insufficient training of personnel, insufficient personal protective equipment and lack of knowledge regarding the proper use of such equipment. It recommended the compilation of rules and the establishment of standards, along with effective training for personnel [27]

A study conducted in a Palestinian hospital in the West Bank showed that there was insufficient separation between hazardous and non-hazardous wastes and there was an absence of necessary rules and regulations for the collection of waste materials from the hospital wards.[28]

Lack of awareness, appropriate policy and laws, and willingness have been responsible for the improper management of medical waste in Dhaka City [29]. In a recent sudy in the Sultanate of Oman, nurses had better satisfactory knowledge (90.9%), attitude (94.5%) and practice (80%) scores as compare to other participants.[30] A study of medical waste management in the south of Brazil revealed that all the health care facilities promoted segregation of Group A wastes, especially sharps waste. However, not much attention was given to other types of waste, which were usually managed without a perspective for recycling and collected through the municipal collection system. [31]

It can be seen from the above discussion that biomedical waste management is currently an area of concern not only for India but also other countries. There is lack of proper knowledge, awareness in other countries also. Most studies show that the technical persons such as nurses, technicians have better practice, however, doctors lack in that. Our study also showed a remarkable percentage of doctors not aware of BMW management in terms of knowledge, attitude and practice. In most studies sanitary staff and housekeeping non technical persons were found to be lacking in the segregation of wastes and their proper disposal.

Summary:

The current study was conducted in major diagnostic healthcare centres in the West Midnapore district of West Bengal as, after extensive search, no recent study was found in his regard in the state which comprised of many diagnostic centres. The objective of the study was to assess the knowledge, attitude and practice of the healthcare providers in the centre through a pretested, pre designed structured questionnaire. The questionnaire had three sets of questions, with 10 questions each about the knowledge, the attitude and the practice measures of biomedical waste management. 270 participants took part in the study and all of them filled and returned the questionnaire. Only 15 doctors were found to have good knowledge and most technicians had above average knowledge. The housekeeping staff and attendant were found to have poor knowledge regarding biomedical waste management. Many participants considered it as a burden to daily work. Various studies were consulted and referred to during the course of the study to obtain proper direction and assess the scenario regarding BMW management in different areas of India and also abroad. Our study tallied with the percentages obtained in most. These studies opined that the nurses had better knowledge compared to sanitary/ housekeeping staffs. Similar results were found in our study where there were no nurses in the study population but technical staff in form of laboratory technicians were there. Different studies abroad also showed poor abiding of BMW waste management laws and legislations.

Recommendations :

All measures should be adopted to inform the persons concerned about legislation regarding BM waste management, including the risks involved in improper disposal. Illiteracy might be a hindrance in it, but methods can be applied to overcome that. Role plays, posters, awareness programmes might be a few ways. The segregation posters should be displayed enough at the sources of waste generation and near the waste bins. An involvement of the top management is important in this regard. The management and the workforce should work together and recognitions can be meted out to the people practising better BMW management. The present study was conducted in one district, on the diagnostic centres. So, there is scope for larger studies involving the major healthcare centres-hospitals of different districts across different categories of staff. Cross sectional studies are recommended throughout the hospitals in future.

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APPENDIX-1
QUESTIONNAIRE:
You work in the organisation as:
a. Doctor
b. Laboratory technician
c. Laboratory attendant
d. Group D staff

Questions
Knowledge

1. Do you know about the existence of a bio medical waste legislation ?
2. Which year there was last update of the biomedical waste management legislation?
3. Who regulates the safe transport of biomedical waste in india
4. Is it important to meticulously follow bmw rules
5. What is the most common waste produced in a healthcare center
6. Which of the following is an example of bmw
7. What agency(ies) regulate(s) wastes generated at health care facilities?
8. According to government guideline , untreated BMW should not be stored beyond
9. Are you aware of different categories of biomedical waste generated?
10. Does hepatitis B immunization prevent transmission of hospital acquired infection?

Attitude

1. Is it important to increase your awareness on bmw management by attending seminars/meetings ?
2. How important is segregation of waste at source?
3. Waste management is team work/no single class of people is responsible for safe management.
4. Safe management efforts by the hospital increase the financial burden on management.
5. Safe management of health care waste is an extra burden on work.
6. Do you think your knowledge regarding biomedical waste management is adequate?
7. Do you think that an effluent treatment plant for disinfection of infected water should be set up in big helahtcare centres?
8. Is occupational safety of waste handlers important?
9. Does the pollution control board need to know about any non complying healthcare centre?
10. Do you think bmw management should be in the curriculum of any healthcare training course?

Practice

1. How is bmw separated ?
2. Do you follow separation of bmw ?
3. How do you dispose needles?
4. Do you dispose blood soiled cotton and paper in the same container?
5. The colour code for the BM waste to be autoclaved, disinfected is:
6. The colour code for disposal of normal waste from the centre is:
7. All the following steps should be followed after an exposure with infected blood/body fluid and contaminated sharps EXCEPT:

o Exposed parts to be washed with soap and water. o Pricked finger should be kept in antiseptic lotion.

o Splashes to eyes should be irrigated with sterile irrigants. o Splashes to skin to be flushed with water.

8. How to dispose used blood vials?
9. How to dispose expired medicine?
10. Is bmw disposal practiced properly at your centre?