Original Research Article

Assessing awareness and execution of "Bio medical waste management rules 2016" among health care providers and grade 4 workers in a tertiary care hospital of Bhubaneswar

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A B S T R A C T

Background: Hospital waste has always been a concern for the society. Recently the government has changed the BMW handling rules in 2016. However, mere introduction of laws is not sufficient for proper disposal of BMW. Awareness of these laws is also essential. Hence, this study was conducted with the objectives to assess the Knowledge, awareness, attitude & practice (KAP) towards biomedical waste management in Health care providers (HCP) and prevalence of needle-stick injury (NSI) in them.

Methodology: This was a cross-sectional study done from August 2018 to January 2019 in KIMS among 400 participants. A pre-tested, close ended questionnaire was used with few added questions related to new rules.

Results: An overall average level of KAP among HCP and grade 4 workers regarding BMW Rules and management 2016 with 86.49% doctors, 91.04% dentists, 79.55% nurses and 80% grade 4 workers securing average marks in the assessment. Moreover, 14 (20 .59%) doctors, 10 (14 .71%) dentists, 30 (44 .12%) nurses and 14 (20.59%) grade 4 workers reported that they had experienced NSI in the past 12 months. Overall prevalence of NSI is found to be 17%.

Conclusion: We found an average level of knowledge, attitude and practice among HCP and grade 4 workers regarding BMW management. It is recommended that regular monitoring and training are required at all levels of Health Care System and the rules should be sincerely followed and practiced.

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1. Introduction

Bio-medical waste (BMW) comprises the waste which is generated from the health care system during the process of health care delivery.[1] It is defined as the waste generated during diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production and testing of biologicals and is contaminated with human fluids.[2]

BMW includes syringes, human tissues, amputated body parts, aborted foetus, needles, organs, body fluids, ampules,

dressings, Pharmaceutical waste like antibiotics, cytotoxic drugs, etc. Disposable plastics, liquid waste generated from laboratories, microbiological wastes, discarded linen, mattresses, beddings and items contaminated with blood.[3] Considerable amount of BMW is being generated from the health and related sector, be it the medical and dental hospitals, clinics, health camps, blood donation camps, pharmacies, surgical equipment and pharmaceutical companies.[4] As per WHO fact sheet, hospital wastes comprise of non-hazardous waste (85%), hazardous infectious waste (10%) and hazardous non-infectious waste (5%). In short, approximately 10-20% of the waste generated by the above mentioned units is reported to be

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infectious or hazardous.[5] In recent times, disposing such waste is the biggest challenges for any health care system. With the mushrooming of health care providing units, ascends the biomedical waste generation in surplus amount and the health issues related to it.[6] With a generation rate of 0.5-2.0 kg/bed/day,[7,8] the estimated hospital waste generation is about 0.33 million tons annually.Improper and insufficient handling of this waste may induce serious threat to human health and his surrounding environment. For eliminating potential risk of mismanaged handling of biomedical waste & reducing health problems, rules were framed by The Environment and Forests Ministry (MoEF), Govt. Of India on July 20, 1998 known as the Biomedical Waste (Management & Handling) rules. This laid down categories of BMW and its appropriate segregation, transport, treatment and disposal with few amendments made in 2000, 2003 and 2011. The MoEF & climate control under the environment protection Act 1986 has notified the new BMW Rules 2016, on March 28th 2016, to replace the earlier rules & amendments thereof. This act provided a regulatory framework for strict treatment and disposal of the BMW under its rules of management and handling.

Improper handling of BMW leads to hazardous exposure to waste handlers and health care providers, who are prone to occupational exposure most commonly needle stick injuries population which increases the risk of infections like Hepatitis B and HIV/AIDS.[5,9] These wastes if not disposed safely can get in close proximity to the general public, who are mostly unaware of the consequences. The introduction of laws is not sufficient for proper disposal of BMW. The awareness on these laws among the general public as well as medical professionals and waste handlers are essential. Accordingly, our study aims to determine knowledge, attitude, the extent of sincerity in practice, towards biomedical waste management rules, among the HCP and grade 4 workers of the tertiary care hospital in Bhubaneswar, Odisha. The study also assessed the prevalence of the occupational NSI among the study participants.

2. Materials and Methods

This was a cross-sectional study conducted between August 2018 to December 2019 in Kalinga Institute of Medical Sciences (KIMS) in Bhubaneswar, Odisha. This is a 1750 bedded private medical teaching hospital with a Dental (KIDS) and Nursing college (KINS) located in same campus. These are relatively advanced health institutions delivering competent medical and dental care, education providing suitable training for medical and para-medical staff. The type and composition of BMW generated from these institutions largely vary depending on their capacity and specialization. They engender almost all types of BMW. The study was initiated after obtaining the required clearance from the Ethics Committee of the Institution.

A total sample of 400 participants was taken by non-probabilistic convenient sampling method, as done by previous study.[10] An informed consent was obtained from each participant for the study after detailed explanation of the study procedure. A pre-designed, pre-tested, close ended questionnaire was taken from a similar study conducted in India with few added questions related to new rules.[10] The questionnaire was divided into 4 sections, with 10 questions each.

Scoring was done for the first 3 sections which were on knowledge, attitude and practice about BMW current rules and management. Each question carried 1 mark and grading system was based on - Excellent being score of 80%. Average being 40 -79%; Poor <40%. The fourth section had the assessment on level of knowledge among the study participants about NSI and Hepatitis B vaccination status. The questionnaire was printed in English and local language (Odia) to capture the responses of all the study participants hailing from different linguistic groups. Those who could not understand English or Odia were excluded from the study. Study participants were medical doctors, dentists, nurses belonging to KIMS, KIDS, KINS, respectively and the grade 4 workers of KIMS. The data was collected and was entered in Microsoft Excel database 2016. Descriptive analysis was done using standard statistical software Stata 15.1.

3. Results

Out of the total 400 health care providers and grade 4 workers interviewed, 37% (148) were doctors, 33.5% (134) dentists, 22% (88) nurses and 7.5% (30) grade 4 workers. (Figure 1). In the study population, we found that only 25% nurses and 20% grade 4 workers had excellent knowledge about BMW management followed by 16.22% doctors and 10.45% dentists. While majority of the study participants had average knowledge about BMW management with 73.33% grade 4 workers, 67.57% doctors, 63.64% nurses and 56.72% dentists had an average knowledge on the same (Figure 2). On assessing the responses of the participants about their knowledge on the year of inception of the current BMW Rules, only 45.5% reported to know the correct answer to it. Only 40% of them knew about the new BMW categories. Other questions, like their knowledge on the phase out of chlorinated bags, a few (30%) of them were aware of it. Moreover, 68% participants had the correct idea on the specific authority regulating the secure transport of medical waste. Our study reports that 76% health care providers and grade 4 workers agreed that team work is required in waste management. Safe management imparts extra burden in terms of work is considered by 27.5% respondents and in monetary terms by 36% respondents.

Our study found an overall average level of knowledge, attitude and practice among HCP and grade 4 workers regarding BMW Rules and management 2016 with 86.49%
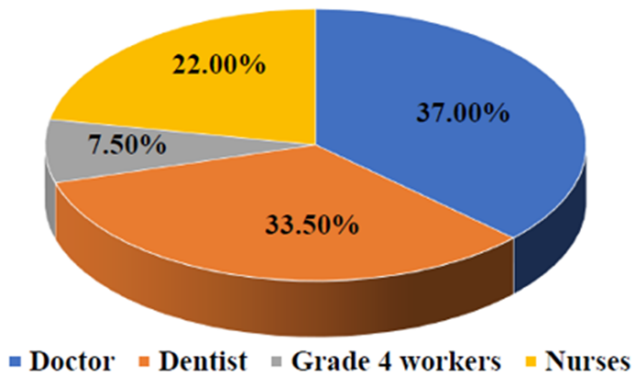
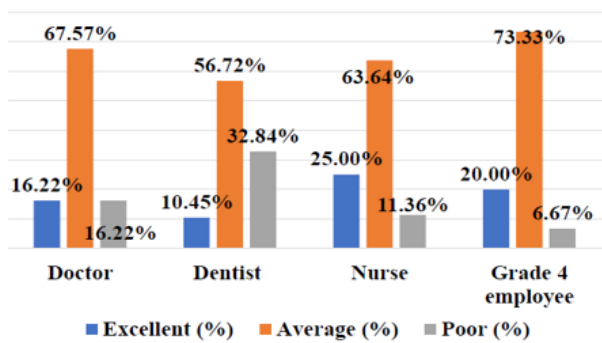**Fig. 1:** Showing job position of study participants

Fig. 2: Knowledge about BMW management

doctors, 91.04% dentists, 79.55% nurses and 80% grade 4 workers securing average marks in the assessment (Figure 3). In the 400 respondents, 54.5% respondents reported that they have a habit of re-capping the used needle before disposing it. Furthermore, 14 (20.59%) doctors, 10 (14 .71%) dentists, 30 (44 .12%) nurses and 14 (20 .59%) grade 4 workers reported that they had experienced NSI in the past 12 months. Overall prevalence of NSI is found to be 17%. It was surprising to find that only 47% participants were fully inoculated against Hepatitis B virus.
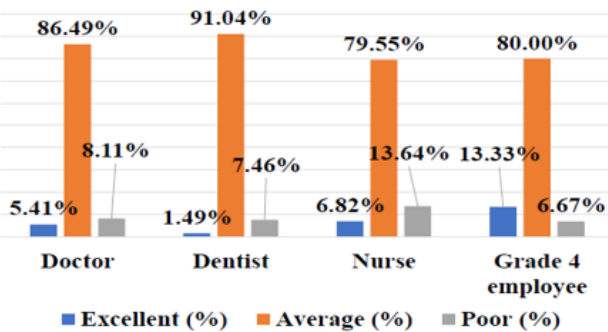

Fig. 3: Knowledge attitude and practice of BMW management

Further analysis was done to find the association between the attitude and practice of BMW management of the study population at workplace with their knowledge and awareness about it (Figure 4). Figure 4 A shows that out of the 45.5% participants who were aware of the year of inception of new BMW Rules, 71.43% participants knew the colour coding for BM waste disposal. Inspite of knowing the correct colour coding system for waste disposal, 18.46% subjects had experienced NSI in past 12 months. Figure 4 B represents the data that 91.5% subjects considered BMW as a concern, of whom, only 40.98% knew the correct categories of the waste and still, among those who knew correct categories, only 38.67% participants were aware of the purpose of newly introduced- white bag. Figure 4 C shows that 86% of the subjects were aware of the consequences of NSI, in spite of which 56.4% were still following the practice of re-capping the used needles and out of these participants who were re-capping, nearly half (49.48%) of the subjects had reported to be fully inoculated by Hepatitis B vaccine.
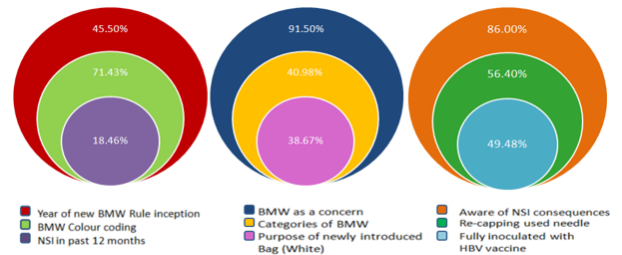

Fig. 4: Evaluation of attitude and practice of BMW management with knowledge on specific among study participants

4. Discussion

A close-ended type questionnaire with few open-ended questions was used, in order to avoid any recall bias and to get quick response from the participants. All the participants are engaged at the same work place and hence, all were under the same protocol (BMW 2016) for waste management and its handling.

In our study, we have taken professionals from all three branches viz., medical, dental and nursing, which stands as an advantage with the previous studies. Present study found 86.49% doctors, 91.04% dentists, 79.55% nurses and 80% grade 4 workers to have an average level of knowledge, attitude and practice (KAP) in BMW management and handling. While an excellent level of KAP is observed in 13.33% Grade 4 workers, 6.82% Nurses, 5.41% Doctors and 1.49% Dentists. Similar observations were found by Bhagwati et al,[11] where nurses and paramedical staff had better knowledge and practice about the BMW policy than the doctors. Saini et al.[12] showed in his study that 59.23% had good level of knowledge regarding BMW and 81.55%

were aware about practice of BMW management. This contrast in the observations with other studies is due to the fact that the different strata of study population were not equally distributed in the sample size which may be taken as a drawback of this study. Another reason may be the fact that many doctors and dentists in the study population had recently joined this institution because of which proper attitude and practice towards BMW is still lacking. While Narang et al.[13] compared the BMW KAP among the health care personnel which reported doctors, nurses and lab technicians to have better score than the grade 4 workers.

In a study from Senegal, where 5 hospitals in Dakar were assessed regarding Knowledge about BMW. It was found that the level of knowledge was deemed satisfactory by 62.6% of interviewees.[14] Many studies from other developing countries have been documented in literature showing inadequacy of knowledge and indigent attitude among HCP and the waste handlers.[12,15–19] This shows that the problem is not unique to India. The attitude and practice towards BMW management and handling has to be improved to a level where it can significantly reduce the hazards associated with its poor handling.

In the present study, 44.14% HCP and grade 4 workers reported to know the categorization in biomedical waste rules. In the study done by G. Bhagawati et al[11] only 17% of the health care workers were aware of the number of categories of BM Waste while Narang et al.[13] and Saini et al.[12] showed 85% and 82%, respectively. The difference in observation may be due to the fact that all other studies were done with reference to old rules. Few of the HCP still remembers the old rules in which there were 10 categories whereas in the new rules, there are 4 broad categories.

In our study, we found that 76.99% participants agreed on waste management being a team work and no single class is responsible whereas, 15.27% did not agree. 33.26% respondents did not consider management of BMW in a safe manner to be an issue while 6.28% failed to comment on the same. Similar observation was found in Sharma et al.[10] where, it was reported that 65% health care personnel agreed that BMW management requires team work and 29% subjects responded that safe management was not an issue at all while 30% could not comment. On the other hand, in the study done by G. Bhagawati et al., 86% respondents agreed that BMW Management needs team work.[11]

On assessing the knowledge of the study participants on the newly introduced Biomedical waste management rules 2016 in the present study, 42.26% respondents reported to be aware of the year of introduction, 41.63% knew the colour of new bag introduced, 39.12% were aware about purpose of the new bag and 30.13% were aware about phasing out of chlorinated plastic bags and use of non-chlorinated bags.

Safe management efforts by hospital staff were considered to be an extra burden on work by 30.75% and 39.54% participants agreed that it increases financial burden on the hospital management in this study. Higher incidence were shown in study done in Jaipur[10] where 50% respondents agreed to this statement. The difference in the work profile of the sampled population and sample size in both the studies might have played an important role in the formation of results.

Assessing NSI experienced by respondents in past 12 months, our study found 9.46% doctors, 7.46% dentists, 34.09% nurses, 46.67% grade 4 workers got the prick on at least one occasion. While in the study from Jaipur,[10] 50% grade 4 workers, 5% dentists and 2% nursing staff reported that they had experienced such event in past 12 months. Overall 17% of the study population have experienced NSI in past 12 months which is approximately the half when compared to the study done by Sharma S,[17] who reported NSI in 33.33% respondents in past 6 months, while none of them reported the incident to the authority. In our study, only 5.44% subjects had reported the incident, of whom the majority were nurses.

Of the entire population in our study, 44.65% doctors, 39.85% dentists, 61.36% nurses and none of the grade 4 workers have been completely immunized against Hepatitis B infection. Around 47% respondents are fully inoculated with Hep B Vaccine. Our findings were in accordance with the study done in Sikkim by Thapa M[20] where, 46.7% were vaccinated against Hepatitis B Virus. Poor Hep B immunization coverage was seen among Medical Health Workers as reported in U.K. (21%),[21] Libya (27.5%)[22] and Turkey (27.5%).[23]

HBV infection is one of the major diseases that cause serious public health problems with about 2 billion people globally being infected, out of which more than 350 million have chronic HBV. It has been estimated that, annually, about 1.2 million people die globally from chronic HBV infection, cirrhosis and liver cancer.[24] Global HBV endemicity ranges from high ($\geq$ 8%) to intermediate (2-7%) and low (< 2%).[9,25,26] Hep B vaccination seems to be the only mode of prevention against this deadly viral infection which should not be neglected at least among the Health Care Provider themselves who relied upon with the duty to impart knowledge to the entire community.

5. Conclusion and Recommendation

The present study found an average level of knowledge attitude and practice among health care providers regarding BMW management. It is imperative that the waste should be segregated and disposed off in a safe manner to protect the environment and promote environment and human health.

Hepatitis B vaccination was taken by only 47% respondents which shows negligence among the HCP despite having the knowledge of this infection. The

prevalence of Needle Stick Injury in the study population was found to be 17%, which should be minimised by implementing proper BMW management and training. Hence, it is recommended that regular monitoring and training are required at all levels health care system. HCP and the workers should sincerely follow BMW Rules and practice its proper handling and management.

6. Source of Funding

None.

7. Conflict of Interest

None.

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