Knowledge, attitude and practice assessment of biomedical waste management in tertiary care hospital: It’s high time to train ourselves

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Background: Biomedical waste can cause spread of infectious diseases and it is hazardous. Segregation and suitable treatment of BMW is needed and for that health care staff should be aware of it.

Aims
1. To assess and compare the knowledge, attitude and practice regarding biomedical waste management (BMW) in doctors, nurses and class four workers.
2. To assess effectiveness of a training programme regarding BMW management among them.

Study design: Cross sectional study.

Participants: Doctors (100), nurses (100) and sanitary staff (50).

Material and method- Pre-test & post-test questionnaire regarding knowledge, attitude and practice of biomedical waste management followed was given. Results were analysed.

Statistical analysis: Statistical analysis was done using Chi-Square Test and percentage. Statistical analysis was done using SAS (Statistical Analysis System) software version 9.4.

Setting: Tertiary care hospital attached to medical college, Western Maharashtra.

Results: Doctors were having good knowledge followed by nurses followed by sanitary staff. Statistically significant improvement was found after training programme in all groups.

Conclusion: Knowledge, attitude and practice regarding BMW management varied in different group. It was improved after training programme of BMW management. We recommend that periodic training regarding BMW management should be there.

Keywords: Assessment, Biomedical waste management (BMW), knowledge, attitude and practice (KAP), Pre-test, post-test.

1. Introduction

WHO defines ‘Biomedical waste (BMW)’ as any waste generated during diagnosis, treatment or immunisation of human beings or animals. It is generated from government and private hospitals, nursing homes, clinics, medical laboratory, veterinary hospitals etc (The Gazette of India, 1998) As India’s population increases rapidly the demand of health care increases same
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It results in a rapid increase in hospitals, nursing homes, laboratory, blood banks, etc. It generates a huge amount of biomedical waste (BMW). In India, around 1.5 to 2 kg waste is generated per bed per day in hospitals and annually, 0.33 million tons of BMW is generated. WHO states that 85% of hospital wastes are non-hazardous, 10% are infectious, and 5% are non-infectious but hazardous wastes. In the USA, 15% of hospital waste is infectious waste whereas in India, it could range from 15% to 35% depending on total waste generated. (WHO, 253)

BMW includes human waste such as body fluids, discharges, anatomical waste from any body parts, chemical waste which includes discarded medicine, microbiological waste, sharps such as needles, glasses, plastic waste like I.V. lines, catheters, etc. (Glenn McR, 1999)

If proper disposal of BMW is not done, then all wastes generated from hospitals get contaminated and become infectious. In 1998, WHO states that >50000 deaths per day due to infectious diseases. Improper disposal of BMW is one of the major causes for the spread of infectious diseases. Improper disposal leads to the risk of infections like HIV, Hepatitis B and C and many community-acquired infections. Hospital staff, doctors, patients, and more often sanitary staff and general population are at risk. (Chitnis V, 2005)

Recently, in India, BMW management comes into focus with the notification of BMW management and handling rules, the ministry of environment and forests, Government of India, notified the bio-medical waste management and handling rules on 27th July 1998. This rule applies to all those who generate, collect, receive, store, transport, treat, dispose, or handle BMW in any manner and also to every institution that generates BMW. For safe and sustainable management of BMW, knowledge of risk and good practices should be there in health care workers. There is a need of awareness among them. It is not possible without a favorable attitude among them. The most vital component of the waste management is to bring transformation in the mind-set develop a system through education, training, and motivations of health care staff. The Indian Ministry of environment and forest, revised the rules of biomedical waste management and handling in 2011 which replaces some earlier rules. Our study aims estimation of present knowledge, attitude and practice (KAP) of health care workers through a pretested questionnaire and estimation of improvement in KAP after training programme for waste management, made them aware of new rules.

2. Material and methods

An observational study was conducted at a tertiary care hospital attached to the medical college, in western Maharashtra. 250 health care professionals were included in the study from different departments. 100 doctors, 100 staff nurses, and 50 sanitary staff were included. It is assumed that individuals participate in this study will cooperate and will give correct response. After explaining study purpose and type of study, consent was obtained from each participant. Study was conducted in two parts.

3. Stage 1-Assessment

A pretested questionnaire structured by WHO was given to each individual. It contains questions about knowledge, attitude, and practice. Total 16 questions were asked, out of them 5 were pertaining to knowledge, 5 for attitude assessment in which problem statement relevant legislations, hazards related questions was asked. Practice assessment done by 6 questions regarding segregation procedures, colour coding and waste treatment methods. For
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Doctors it was in English language and for nurses and sanitary staff it was in local language (Marathi). 10 minutes time was given to respond questionnaire. Knowledge, attitude and practice were defined as written response to questions regarding each of these. Results and identity were kept confidential.

4. Stage 2 interventions

An educational training programme was conducted for doctors. A lecture session with power point presentation on various aspect of BMW management, treatment methods, followed by demonstration of colour coded bags, different equipment hand washing and segregation practice was conducted. This was followed by interactive session, in which participants query & doubts regarding practical problems in the application of BMW was discussed. After the session the questionnaire was given to them. Similarly the training programme was taken for nurses and sanitary staff in local language. Statistical analysis was done using Chi-Square Test and percentage. Statistical analysis was done using SAS (Statistical Analysis System) software version 9.4. All the above asked questions were polar questions which were answered either “Yes” or “No” by the participants. In each set of questions the correctly answered questions and their percentages was calculated. According to the percentages, two categories were made i.e, less than 60% and more than 60% scoring.

5. Results

Out of 250 study subjects, 100 (40%) were nurses, 100 (40%) were doctors and 50 (20%) were sanitary staff workers. Before training, out of 250 participants 206 (82.4%) had good knowledge about BMW which includes 36.4% doctors, 34.8% nurses and 5.09% sanitary staffs. Before training, out of 250 participants 183 (73.2%) had positive attitude towards BMW which includes 35.6% doctors, 31.2% nurses and 6.4% sanitary staffs. Before training, out of 250 participants 182 (72.8%) had good practice assessment of BMW which includes 34.4% nurses, 6.8% sanitary staffs and 31.6% doctors.

After training, out of 250 participants 227 (90.8%) had good knowledge about BMW which includes 37.6% doctors, 35.2% nurses and 18% sanitary staffs. After training, out of 250 participants 201 (80.4%) had positive attitude towards BMW which includes 38% doctors, 31.2% nurses and 11.2% sanitary staffs. Before training, out of 250 participants 224 (89.6%) had good practice assessment of BMW which includes 38.4% nurses, 15.2% sanitary staffs and 36% doctors.

Table 1: Knowledge, attitude and practice assessment of participants before and after training session in percentages.

<table>
<thead>
<tr>
<th></th>
<th>Doctors(100)</th>
<th>Nurses(100)</th>
<th>Sanitary staff(50)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Before Training (%)</td>
<td>After Training (%)</td>
<td>Before Training (%)</td>
</tr>
<tr>
<td>Knowledge Assessment</td>
<td>91</td>
<td>94</td>
<td>87</td>
</tr>
<tr>
<td>Attitude Assessment</td>
<td>89</td>
<td>95</td>
<td>78</td>
</tr>
<tr>
<td>Practice Assessment</td>
<td>79</td>
<td>90</td>
<td>86</td>
</tr>
</tbody>
</table>
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Table 2: Knowledge, attitude and practice assessment of participants with chi-square values and their p-values. (DF=1)

<table>
<thead>
<tr>
<th></th>
<th>Doctors(100)</th>
<th>Nurses(100)</th>
<th>Sanitary staff(50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>chi-square</td>
<td>p-value</td>
<td>chi-square</td>
</tr>
<tr>
<td>Knowledge</td>
<td>43.0632</td>
<td>&lt;.0001</td>
<td>91.2587</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
<td>7.0707</td>
</tr>
<tr>
<td>Attitude</td>
<td>42.5837</td>
<td>&lt;.0001</td>
<td>48.3471</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
<td>18.4874</td>
</tr>
<tr>
<td>Practice</td>
<td>16.0806</td>
<td>&lt;.0001</td>
<td>25.5952</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
<td>8.1340</td>
</tr>
</tbody>
</table>

All the results were statistically significant.

5.1 Discussion

Public concern about medical waste dates back to early 1980’s when large amount of needles and syringes were found on beaches of the East coast of Florida, USA. (The Gazette of India, 2011) In India, awareness and good practice of BMW is still in its infancy. The concern for BMW has increasing when BMW rule comes in force in 1998.

In our study, before training doctors have found to be having highest knowledge compared to nurses and sanitary staff. Attitude of doctors were good towards waste management followed by nurses. Sanitary staff were having poor attitude. In India biomedical waste is part of medical and paramedical student’s curriculum, So knowledge and attitude of doctors and nurses in our study was probably good. Similar findings were found in study from Karnataka. Literature shows doctors awareness about every aspect of BMW management ranged from 57.7% to 96.2 %.(Sharma et al). Sainiet al reported 85% specialist had good knowledge while Yadavannavar et al, stated that teaching staff had good knowledge (97.4%) compared to non-teaching staff. (Sharma S, 2008)

A higher percentage of nurses did good practice of BMW management compared to doctors. 100 % doctors knew about what is BMW, 56% percentage of sanitary staff knew about this, 75% doctors agreed to the question that BMW is hospital staff’s responsibility while 74% nurses and 24% of sanitary staff agreed with same question. Regarding categories of BMW only 70 % doctors, 66% of nurses and 24% of sanitary staff were aware of this. The difference between knowledge could be due to education and literacy level.

The doctors had favourable attitude towards BMW management compared to other groups. The attitude of medical group in general towards the issue of BMW management was positive, but the responsibility for the same was not acknowledged as much by them as compared to the nursing group. Saini et al in their study observed that with regards to questions on attitude towards scientific process of BMW management nurses scored 95-100% as compared to 63–96% in resident doctors. (Saini S, 2005)

In our study, it was found that documentation of waste generation, management was poor. Segregation practice was not proper. This was due to lack of knowledge among sanitary about bio medical waste categories and importance of segregation. Figure 1 given below could explain how bio medical waste was mismanaged at point of generation. In this figure 1,
we can see catheter and plastic waste like soiled waste were disposed in black bag which is for general waste.

![Image](image.png)

**Figure 1:** Showing inappropriate segregation of biomedical waste.

Corrective actions were taken and health care professionals were trained about good practices. Ministry of Environment and forests, Government of India notified the revised rules of biomedical waste in 2011 under environment protection act 1986, it replaces the earlier rules. It is different from earlier rules as these rules are applicable only to BMW and not to radioactive waste, hazardous chemicals, municipal solid waste, and hazardous waste. In these rules it is stated that every occupier of BMW should have arrangement for waste treatment. In earlier rule, lots of confusion was there regarding colour coding and categories of bio medical waste which is to be collected in particular colour bag. For example, category 3 and 6 can be collected yellow bag or red bag, similarly category 7 can be collected in red bag or blue bag. This lead to confusion regarding treatment of waste. In new rules BMW categories and colour coding is clearly mentioned. So there is no confusion regarding treatment of BMW. (The Gazette of India, 2011)

According to World Health Organization, “The human element is more important than the technology. Almost any system of treatment and disposal that is operated by well trained, and well motivated staff can provide more protection for staff, patients and the community than an expensive or sophisticated system that is managed by staff who do not understand the risks, and the importance of their contribution” (World Health Organization,2000).

In these era of collaboration and multispecialty coordination, clinical microbiologist plays important role between clinical and laboratory sciences. BMW management is one of the major aspects of infection control more specifically hospital infection control and for its management microbiologist role is pivotal. Microbiology field extend from laboratory to preventive aspects, infectious disease surveillance, hospital infection control, so training, evaluation surveillance have become integral role of clinical microbiologist. So we have conducted this study. Training directly have impact over performance. This was proved in our study as after training significant improvement was found in Knowledge, Attitude and practice in all participants.

Before training one should understand the gaps and deficiencies of study participant in knowledge, attitude and practices. So while planning training programme these points can be focused. Literature shows that hospital staff should be trained and educated for effective biomedical waste management. Hospital waste management has major attitudinal and Behavioral components. There is need to change this attitude and behaviour through hospital policies and frequent training programme.
5.2 Conclusion and recommendations

Knowledge, attitude and practice regarding BMW management improved after training programme. We recommend that:

1. Health care professional should be aware of BMW management rules and strictly follow them.
2. Compulsory periodic training programme should be there.
3. Training of sanitary staff should be specially emphasized.
4. Every hospital should have biomedical waste management team.
5. Documentation of BMW generation and processing should be maintained.
6. Injuries happened to health professional should be reported to biomedical waste management in-charge.

6. References

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