

# Knowledge, Attitude and Practices regarding Biomedical Waste Management among staff of a tertiary healthcare centre in coastal Karnataka

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## Abstract :

**Background:** Enormous amounts of biomedical waste is generated in our country daily, contains hazardous and infectious materials. In order to make its disposal and treatment successful, it is vital that the various healthcare professionals working at the hospitals have correct knowledge, attitudes and practices regarding biomedical waste management. In the light of evidence from various parts of the country, gaps exist in these domains. Thus it is important to make an assessment of the same.

**Objectives:** To find out the levels of and areas of gaps in knowledge, attitudes and practices among consultants, junior residents, staff nurses, laboratory technicians and house-keeping staff in the various departments of a tertiary care hospital in south India.

**Materials and methods:** A questionnaire-based cross sectional study was conducted among 50 consultants, 51 junior residents, 189 staff nurses, 10 laboratory technicians and 37 house-keeping staff in Kasturba Hospital in the Udupi district of coastal Karnataka, South India.

**Results:** The knowledge of the junior residents was the strongest (90.2%), followed by that of laboratory technicians (80%), consultants (70%), nurses (62.4%) and housekeeping staff (54%). The junior residents showed the best attitudes (94.1%), followed by the laboratory technicians (90%), consultants (88%), housekeeping staff (86.5%) and nurses (80.9%). Many consultants (24%), followed by nurses (23.3%), housekeeping staff (21.6%) and junior residents (17.6%) were not following various precautionary measures like getting immunized against hepatitis B, disinfecting sharps at the point of generation and that many had not undergone any formal training on biomedical waste management.

**Conclusions:** Overall, knowledge, attitudes and practices were better among the laboratory personnel and junior residents than among the housekeeping staff, nurses or consultants. Greater experience or higher qualification does not appear to be a determinant of favourable knowledge, attitudes or practice.

## Introduction:

Enormous amounts of hazardous and infectious wastes are produced in hospitals across the world everyday in the course of various biomedical procedures. India produces approximately 2 kg/bed/day<sup>1</sup>. This biomedical waste comprises of: sharps, which (if improperly segregated) could become agents for spread of deadly diseases like HIV-AIDS, hepatitis B and C infections<sup>2</sup>; human and animal tissues, which also harbour many pathogenic micro-organisms in addition to those mentioned above; cytotoxic wastes as well as recyclable

wastes like soiled or unsoiled plastic and rubber items, which (if inappropriately disposed) could have an adverse impact on ecological balance<sup>3,4</sup>.

Good quality biomedical waste management entails not only proper adherence to protocol at healthcare facility level but also, investment in and implementation of disinfection, recycling and disposal at the terminal site<sup>5</sup>. However, success of the latter steps depends on initial processing i.e. the one done at the point of generation, in healthcare facilities, in the first place<sup>2</sup>, the quality of which, we believe, depends upon the knowledge, attitudes and practices of the various healthcare professionals working therein<sup>6</sup>.

India has well-established protocols for handling and management of biomedical wastes, namely, the BMW

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(Management and Handling) Amendment Rules, 2000. These rules mandate healthcare facilities to segregate, disinfect and dispose biomedical wastes in a manner which protects the safety of healthcare professionals as well as that of the environment<sup>4</sup>. Training of the various healthcare professionals with respect to biomedical waste management is incorporated in curricula as well as job orientation programs.

However, evidence from various parts of India suggests that, gaps in knowledge and lacunae in attitudes and practices are still prevalent to a worrying extent among the various categories of healthcare professionals<sup>5,7-11</sup>.

This being a matter of concern, a study was warranted to assess their knowledge, attitudes and practices with respect to biomedical wastes in this part of the country. It was hoped that such a study would elucidate upon the magnitude and distribution of gaps and / or disconnects in and between theory and practice.

### Objectives:

1. To find out the levels of knowledge, attitudes and practices among consultants, junior residents, staff nurses, laboratory technicians and house-keeping staff in the various departments of a tertiary care hospital in south India
2. To find out the areas of gaps in knowledge, attitudes and practices among consultants, junior residents, staff nurses, laboratory technicians and house-keeping staff in the various departments of a tertiary care hospital in south India.

### Methodology :

**Study design:** A cross-sectional study

**Study setting:** The study was conducted in Kasturba Hospital, a privately managed 2032-bedded tertiary care teaching hospital in the Udupi district of coastal Karnataka, South India.

**Study population:** The study population comprises of the following: consultants (faculty and senior residents), junior residents (postgraduate trainees and interns), staff nurses, laboratory technicians and house-keeping staff working in the various departments of the hospital.

**Study period :** July 2012 – November 2013

**Eligibility criteria :** Any consenting and trained individual belonging to the above categories was included into the study. There were 2099 eligible participants, comprising of 312 consultants, 316 junior residents, 1178 staff nurses, 60 laboratory technicians and 233 house-keeping staff (categories elaborated below) in the hospital. This was taken as the sampling frame.

**Sample size:** Anticipating that 50% of the participants had accurate knowledge (our outcome variable) about the rules and principles of biomedical waste management<sup>12</sup>, with 10% allowable error, at 95% confidence interval, and accounting for the finite population correction for 2,099 participants, a minimum sample size of 325 was calculated. Accounting for 10% non-response, it was decided to approach 361 individuals.

**Sampling strategy:** A stratified sampling technique was employed, the participants being stratified according to their designation (surrogate for professional qualification and experience – a potentially confounding variable) as consultants (faculty and senior residents), junior residents (postgraduate trainees and interns), staff nurses, laboratory technicians and house-keeping staff. The participants were thus proportionately allocated to the strata: 48 consultants, 49 junior residents, 183 staff nurses, 9 laboratory technicians and 36 house-keeping staff (minimum 325 participants in all). Taking a non-response rate of 10% into account, it was decided to approach 54 consultants, 54 junior residents, 203 staff nurses, 10 laboratory technicians and 40 house-keeping staff (361 individuals in all).

**Ethical approval:** Ethical consent was obtained from Institutional Ethics Committee

**Materials and Methods :** A pre-tested, semi-structured questionnaire was used as the data collection tool. It contained 30 questions. The knowledge questions assessed the participant's knowledge on facts like – all the colour codes and their meanings, biomedical hazard symbol, incinerability of wastes and hospital protocols for biomedical waste management. The attitude questions pertained to issues such as, whether biomedical waste was considered by the participant was hazardous, whether its management was considered by the participant as an additional burden on his or her work or on the finances of the hospital or even the patients and opinion about legislative measures for waste management. The practice questions assessed whether the participant had undergone any training on biomedical waste management, whether he or she had immunized him or herself against hepatitis B and whether he or she disinfected sharps at the point of generation.

Research assistants were trained in the technique of participant selection, subject information, data collection and analysis. Entries were double-checked for any errors or discrepancies.

The self-administered questionnaires were filled by the participants in a quiet, suitable environment without any

distractions or scope for undue help. They were given the required amount of time to read, comprehend and answer the questions after addressing any doubts or queries, in order to facilitate the most accurate responses.

The questionnaire items were translated from English to Kannada by a professional experienced in translating health survey questionnaires to accommodate a few housekeeping staff. The questionnaires were also back-translated into English in order to check for possible discrepancies and incorporating appropriate changes.

Anonymity of the participants was maintained at all stages of the study.

**Results:** The results were assessed across 3 domains for all the 5 categories of participants. Knowledge, attitudes and practices were graded as 'less than satisfactory', 'satisfactory' and 'good' depending on pre-determined criteria which took into account the correctness of answers. There were a minimum number of 'Must know' questions which determined whether the participant's knowledge, attitude or practice response was categorized as satisfactory and good on the one hand and less than satisfactory on the other. If the number of correct responses was above the minimum criteria, the knowledge, attitude or practice response was classified as good (Good to know).

**The results are displayed as under:**

Table 1: Knowledge among the participants about biomedical waste management

(n=337)				
Category	Less than satisfactory (%) (95% CI)	Satisfactory (%) (95% CI)	Good (%) (95% CI)	Total in each category
Consultants	15 (30) (17.3,42.7)	29 (58) (44.3,71.7)	6 (12) (3,21)	50
Junior residents	5 (9.8) (1.6, 18)	34 (66.7) (53.8,79.6)	12 (23.5) (11.9,35.1)	51
Nurses	71 (37.6) (30.7,44.5)	72 (38.1) (31.2,45)	46 (24.3) (18.2,30.4)	189
Laboratory technicians	2 (20) (0, 44.8)	3 (30) (1.6,58.4)	5 (50) (19,81)	10
House Keeping staff	17 (46) (30,62)	8 (21.6) (8, 35)	12 (32.4) (17.3, 47.5)	37
Overall in each category	110 (32.6) (27.6, 37.6)	146 (43.3) (38,48.6)	81 (24) (19.4, 28.6)	337

Overall, the participants showed fair knowledge regarding biomedical waste management. The knowledge of the junior residents was the strongest, followed by that of laboratory technicians, consultants, nurses and housekeeping staff (in that order). The gaps in knowledge pertained to protocols regarding the post-segregation fate of the various biomedical wastes. However, there were also inadequacies about the knowledge about all the colour codes and their meaning.

Table 2: Attitudes among the participants about biomedical waste management

(n=337)				
Category	Less than satisfactory (%) (95% CI)	Satisfactory (%) (95% CI)	Good (%) (95% CI)	Total in each category
Consultants	6 (12) (3,21)	15 (30) (17.3,42.7)	29 (58) (44.3,71.7)	50
Junior residents	3 (5.9) (0,12.4)	37 (72.5) (55.8,89.2)	11 (21.6) (10.3,32.9)	51
Nurses	36 (19) (13.4,24.6)	73 (38.6) (31.7,45.6)	80 (42.3) (29.6,55.1)	189
Laboratory technicians	1 (10) (0,28.6)	4 (40) (10,70)	5 (50) (19,81)	10
House Keeping staff	5 (13.5) (2.5,24.5)	29 (78.4) (65.15,91.65)	3 (8.1) (0,16.9)	37
Overall in each category	51 (15.1) (11.3,19)	158 (46.9) (41.6,52.2)	128 (38) (32.8,43.2)	337

The attitudes of most of the participants towards biomedical waste management were indeed favourable. Here again, the junior residents showed the best attitudes, followed by the laboratory technicians, consultants, housekeeping staff and nurses (in that order). It is worrying that the biggest lacuna in this domain was in considering biomedical waste management an additional burden on work and finances of the hospital and even, in some cases, of the patients.

Table 3: Practices among the participants about biomedical waste management

(n=337)

Category	Less than satisfactory (%) (95% CI)	Satisfactory (%) (95% CI)	Good (%) (95% CI)	Total in each category
Consultants	12 (24) (12.2,35.8)	22 (44) (30.2,57.8)	16 (32) (19.1,44.9)	50
Junior residents	9 (17.6) (7.2,28)	32 (62.75) (49.5,76)	10 (19.6) (8.7,30.5)	51
Nurses	44 (23.3) (17.3,29.3)	100 (52.9) (45.8,60)	45 (23.8) (17.7,29.9)	189
Laboratory technicians	1 (10) (0,29)	-	9(90) (71.4,100)	10
House Keeping staff	8 (21.6) (8,35)	1 (2.7) (0,7.9)	28 (75.7) (61.9,89.5)	37
Overall in each category	74 (22) (17.6,26.4)	155 (46) (40.7,51.3)	108 (32) (27,37)	337

Though the majority of the participants demonstrated good biomedical waste management practices, it must be noted that many consultants, followed by nurses, housekeeping staff and junior residents (in that order) were not following various precautionary measures like getting immunized against hepatitis B, disinfecting sharps at the point of generation and that many had not undergone any formal training on biomedical waste management.

### Discussion:

More than 50% of the participants, across categories, showed knowledge, attitudes and practices as satisfactory or good.

The laboratory technicians and junior residents fared better in all the 3 domains – knowledge, attitude and practices as compared to the nurses and the consultants. However, it is observed that, overall the average participant is weakest in knowledge, followed by practices and attitudes. Also, this trend is maintained within each of the categories. This shows that though the attitude of the most of participant towards biomedical waste is favourable and though they are capable of right practice, their overall performance in this regard could be marred by their lack of knowledge. This seems to be a logical argument as it plausibly seems that better knowledge can enhance attitudes and lead to better practices as well<sup>6</sup>.

These conclusions are however limited by lack of statistical power to prove hypotheses. Also, as (for purposes of anonymity) no information on possible covariates (e.g. experience, qualification and field or department) was collected it is not possible to comment on the possible determinants of the lack of the right knowledge, attitudes or practices. However, it would nevertheless appear that, greater experience and higher qualification may not be determinants as indicated by the better performance of the junior residents and laboratory personnel. This result seems to vary from the one arrived at by Mathur et al<sup>6</sup> in their study done in 2010 in Allahabad, wherein, they attribute poor knowledge (as well as the subsequent attitudes and practices) to a

'relatively low level of education' that too among the sanitary staff. Hence, this is an important finding of this study.

Though the results are more heartening than those found by Pandit et al 9 in a study in Gujarat in 2005, they nevertheless point out to the fact that there indeed exists a scope for improvement as reflected in the findings of Mathur et al in Delhi in 2010<sup>6</sup>.

It is hoped that these findings would help to enhance the effectiveness of orientation or refresher training programmes targeted at these individuals and help make them more focused, relevant and goal-oriented. Thus, the effective reuse, appropriate destruction of biomedical wastes as well as the safety of the environment in not only this healthcare hub but elsewhere too, would be brought about, as this knowledge would diffuse to other parts of the country through this human resource.

### CONCLUSIONS:

1. Overall, the knowledge, attitudes and practices among the participants was fair.
2. Knowledge, attitudes and practices were better among the laboratory personnel and junior residents than among the housekeeping staff, nurses or consultants.
3. Greater experience or higher qualification does not appear to be a determinant of favourable knowledge, attitudes or practice.

### RECOMMENDATIONS:

Training programs on biomedical waste management for healthcare professionals need to focus on empowering them with sufficiently broad and practical knowledge.

The affective and attitudinal change with respect to biomedical waste management needs to be inculcated by setting the right examples, leadership, accountability and incorporation of affective component into training programs. The right practices need to be brought about by means of institution-level policy change with ethical binding requirements for all biomedical waste-generating activities and consequences thereof (e.g. accidental injury with sharps, hepatitis B vaccination, universal precautions) supported by IEC (information, education and communication) strategies like charts, prompts etc. Accountability may be ensured by random “surprise” checks by trained staff equipped with checklists. No healthcare professional (irrespective of his experience or qualification) should be left untouched by these interventions.

**Declarations:** The authors hereby declare that they have no conflicts of interest.

#### References:

1. Patil AD, Shekdar AV. Health-care waste management in India. *J Environ Manage.* 2001;63:211-20.
2. Prem Nath A, Prashanthini V, Visvanathan C. Healthcare waste management in Asia. *Waste Management.* 2010;30:154-61.
3. Lakshmikantha H. Report on waste dump sites near Bangalore. 2006;26:640-50.
4. Misra V, Pandey SD. Hazardous waste, impact on health and environment for development of better waste management strategies in future in India. *Environment International.* 2005;31:417-31.
5. Pattnaik S, Reddy MV. Assessment of Municipal Solid Waste management in Puducherry (Pondicherry), India. *Resources, Conservation and Recycling.* 2010;54:512-20.
6. Mathur V, Dwivedi S, Hassan MA, Misra RP. Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel: A Cross-sectional Study. *Indian J Community Med.* 2011;36:143-5
7. Verma LK, Mani S, Sinha N, Rana S. Biomedical waste management in nursing homes and smaller hospitals around Delhi. *Waste Management.* 2008;28:2723-34.
8. Kumar S, Bhattacharyya JK, Vaidya AN, Chakrabarti T, Devotta S, Akolkar AB. Assessment of the status of solid waste management in metro cities, state capitals, class I cities, and class II towns in India: An insight. *Waste Management.* 2009;29:883-95.
9. Pandit NB, Mehta HK, Kartha GP, Choudhary Sk. Management of biomedical waste: Awareness and practices in a district of Gujarat. *Indian J Public Health.* 2005;49:245-7
10. Rao PH. Report: Hospital waste management – awareness and practices: A study of three states in India. *Waste Manage Res.* 2008;26:297-303
11. Kishore J, Goel P, Sagar B, Joshi TK. Awareness about biomedical waste management and infection control among dentists of a teaching hospital in New Delhi, India. *Indian J Dent Res.* 2000;11:157-61
12. Saini S, Nagarajan SS, Sarma RK. Knowledge, Attitude and Practices of Bio-Medical Waste Management Amongst Staff of a Tertiary Level Hospital in India. *Journal of the Academy of Hospital Administration [Internet].* 2005 Jan-Dec [cited 2013 November 3];17(2). Available at: <http://www.indmedica.com/journals.php?journalid=6&issueid=72&articleid=899&action=article>.

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