BIOMEDICAL WASTE MANAGEMENT PRACTICES OFDOCTORS: AN ONLINE SNAPSHOT

Mohapatra Archisman[1], Gupta Manoj K[1], Shivalli Siddharudha[1], Mishra CP[2], Mohapatra SC[2]

[1]Resident, [2]Professor, Department of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh (UP), India, 221005.

ABSTRACT

Objective: This study was undertaken with the objective to assess the professional behavior of doctors in India regarding Bio-Medical Waste (BMW) management.

Methods: A predesigned questionnaire containing a set of nine open-ended questions was sent to 557 email contacts obtained randomly from social networking sites by using respondent-driven sampling technique. Non-duplicated opinions from only those respondents who had completed their medical education in India and working in the country were included for analyses.

Results: Remnant knowledge of BMW management as self-adjudged was significantly (p<0.001) poor among post-graduates (35.5%) than medical graduates (75%). It was evident that proper practice of BMW segregation at the work place had a significant association (p<0.001) with higher knowledge of the same. Almost one third respondents did not know about the bio-hazardous waste symbol.

Discussion and Conclusions: This study underscores the need for effective BMW management training of medicos with regular refresher sessions.

Keywords: Biomedical waste, doctor, online, practice, professional behavior, respondent-driven technique.

INTRODUCTION

Waste generated by health care activities includes a broad range of materials, from used needles and syringes to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices and radioactive materials. The waste produced in the course of healthcare activities carries a higher potential for infection and injury than any other type of waste. Inadequate and inappropriate knowledge of handling of healthcare waste may have serious health consequences and a significant impact on the environment as well. Of the total amount of waste generated by health-care activities, about 80% is general waste. The remaining 20% is considered hazardous material that may be infectious, toxic or radioactive.[1] In developed countries approximately 1-5 kg of waste is generated per bed per day.[2] In India, it is estimated to be 2.0 kg/ bed/ day.[3]Quantity may vary depending upon the specialty of the source health set-up, its hierarchical position and service utilization patterns.

The responsibilities of a hospital do not end up with medical treatment only. In broader perspectives, service towards sustenance of the 'good' health of the society is a default duty of any health care set-up. In this context, proper management of biomedical wastes (BMW) is of utmost public health importance. Lack of awareness about the health hazards related to health-care waste, inadequate training in proper waste management, absence of waste management and disposal systems, insufficient financial and human resources and the low priority given to the topic are the most common problems connected with health-care waste. Many countries either do not have appropriate regulations, or do not enforce them.Though legal provisions [Biomedical Waste (management and handling) Rules 1998][4] exist to mitigate the impact of hazardous and infectious hospital waste on the community, still these provisions are yet to be fully implemented.

BMW management has been entrusted with waste segregation at the source of generation intolabeledcolour-coded containers/bags that

have been pre-assigned for the ten defined categories.[4]Attitude and understanding of the issueare important determinants for waste triage at the source.[5]Across all specialties, doctors need to have exemplary professional practice in this regard. However, awareness among them preconditions their attitude and understanding. Hence, the present study was carried out with the objective to assess the professional behavior of doctors in India regarding Bio-Medical Waste (BMW) management.

METHODOLOGY

Email contacts were obtained randomly from social networking sites '*orkut*' and '*facebook*' through the 'search' option with the keywords 'doctor' and 'Dr'. Additionally, the authors' medico-acquaintances' email contacts were also included in the study. Thus, a total of 557 email ids were procured. A predesigned questionnaire containing a set of nine open-ended questions was sent to these addressesfrom 15th–18th November, 2010. The emails explained the purpose of the study and invited queries of all natures regarding the scope of the research for satisfactory explanation to ensure informed consent for participation. The contacts were asked to recruit further respondents into the study from their acquaintances. Thus, a respondent-driven sampling[6,7]techniquewas also adopted for the study. The questionnaire was kept to the minimum possible to ensure respondents' participation.Email delivery to 54 accounts failed permanently and thus, a total of 503 probable respondents could be successfully contacted. After 15 days, an e-mail reminder was sent to the non-responders on the same email addresses requesting for their contributory participation. To avoid duplication of responses, as a precaution, contacts were asked to ignore the reminder if they had already replied to the first mail. A waiting period of 5 months was affixed for the respondents and their recruited participants to reply to ensure a sizeable response. Non-duplicated opinions from only those respondents who had completed their graduation (MBBS, BDS and equals) were included for analyses using the statistical software SPSS v 16.0.

RESULTS

In total, 364e-mails were received in reply to the mailed questionnaire without any duplication of respondents. This included 319 responses from the primary contacts and 45 from the respondent-driven contacts.Thirty (8.8%) respondents had the highest medical qualification up to graduation while the remaining 334 participants (91.2%) had either completed their post-graduation (MD/MS and equals) or pursuing it. Self-assessed knowledge was categorised as 'good' (>70%), 'average' (50-69%), 'poor' (30-49%) and 'very poor' (<30%). Almost half of the respondents (49.7%)opined that they had forgotten more than 70% of what they knew about BMW management (categorized as "*very poor*") while 153 (42%) doctors claimed that they remembered at least 50%.**(Table 1)**

Table 1: Respondents' self-assessment of knowledge regarding BMW management

Knowledge self-assessment	Number (%)
Very poor (<30%)	181 (49.7)
Poor (30-49%)	30 (8.2)
Average (50-69%)	93 (25.5)
Good (> 70%)	60 (16.5)
Total	364 (100)

Table 2: Association of knowledge of BMW management with qualification and felt need of training of the respondents

Parameter	Knowledge of BMW management			χ^2	P
	<50% No. (%)	**>50%** No. (%)	**Total** No. (%)		
Qualification of the respondents					
Graduation	15 (25.0)	45 (75.0)	60 (100.0)	32.05	**<0.001**
Post-graduation	196 (64.5)	108 (35.5)	304 (100.0)		
Felt need of training					
Yes	205 (61.4)	129 (38.6)	334 (100.0)	19.34	**<0.001**
No	6 (20.0)	24 (80.0)	30 (100.0)		
Total	211 (58.0)	153 (42.0)	364 (100.0)		

Remnant knowledge of BMW management as self-adjudged was significantly (p<0.001) less among postgraduates (35.5%) than graduates (75%) as shown in **Table 2**.Irrespective of the self-assessed knowledge status of the respondents as regards management of biomedical wastes, the felt-need for training for the same was significantly high (p<0.001).

Medical graduates claimed that they practiced proper bio-medical waste segregation at their work places (45%). Although the postgraduates hinted that they did it less frequently (35.5%),the difference was not statistically significant (p>0.05). It was evident that proper practice of BMW segregation at the work place had a significant association (p<0.000) with higher knowledge of the same. It was observed that doctors working in private set-ups (57.9%) were practicing BMW segregation more frequently than their counter-parts (33.2%) in the public sector (p<0.001). **(Table 3)**

Table 3: BMW segregation practices according to respondents' qualifications

| | Proper BMW segregation practice | | | | |
| | Yes | No | Total | | |
Variable	No. (%)	No. (%)	No. (%)	$\chi2$	p
Qualification of the respondents					
Graduation	27 (45)	33 (55.0)	60 (100.0)		
Post-graduation	108 (35.5)	196 (64.5)	304 (100.0)	1.928	0.165
Self-assessed knowledge of BMW management					
<50%	48 (22.7)	163 (77.3)	211 (100.0)		
>50%	87 (56.9)	66 (43.1)	153 (100.0)	44.235	**< 0.001**
Place of employment					
Public	102 (33.2)	205 (66.8)	307 (100.0)		
Pvt.	33 (57.9)	24 (42.1)	57 (100.0)	12.54	**< 0.001**
Total	**135 (37.1)**	**229 (62.9)**	**364 (100.0)**		

In the public set-ups, the graduates (46.7%) had significantly (p<0.05) better practice of segregating the biomedical wastes at the point of origin as compared to the postgraduates (30.9%). However, in the private sector no such significant differential practice was observed. (p=0.102) **(Table 4)**

Table 4: BMW segregation practices in different set-ups according to respondents' qualifications

| Employer | Qualification of the respondents | Proper BMW segregation practice | | | X2 | p |
| | | Yes | No | Total | | |
		No. (%)	No. (%)	No. (%)		
Public	Graduation	21 (46.7)	24 (53.3)	45 (100.0)		
	Post graduation	81 (30.9)	181 (69.1)	262 (100.0)		
	Total	**102 (33.2)**	**205 (66.8)**	**307 (100.0)**	4.29	**0.038**
Private	Graduation	6 (40.0)	9 (60.0)	15 (100.0)		
	Post graduation	27 (64.3)	15 (35.7)	42 (100.0)		
	Total	**33 (57.9)**	**24 (42.1)**	**57 (100.0)**	2.674	0.102

Almost one out of every three respondents (35.7%) did not know that a symbol had been assigned to indicate bio-hazardous wastes. While 57.7% respondents were aware of all four colour codes (Blue/White-Black-Red-Yellow) used for the bags into which biomedical wastes are segregated, the awareness for red colour was higher (90.9%) than blue (85.2%), black (79.4%) or yellow (79.1%). **(Figure 1)**

DISCUSSION

Some habits come to us by default; education and peer environment certainly have a modulating role in it. Inculcating responsible behavior at par with contemporary pool of good practices is a desirable endeavor. Although, there is an increased global awareness among health professionals about the hazards and appropriate management techniques, the level

of awareness in India has been reported as unsatisfactory.[8-14] This is in contrast to the findings of Mathew S S et al[15] and Yadavannavar MC et al.[16]The present article has attempted to identify a few dimensions and determinants of the practices of medicos in India regarding biomedical waste management. It has been found that over half of the respondents assessed their knowledge of BMW management as 'poor'. The chasm was more evident between the graduates and the post graduates (p <0.001). The 'graduate' group, given the online nature of

the study and profile of internet users in India, is expected to be mostly constituted by young[17]freshly passed doctors. We would like to highlight that education regarding BMW is incorporated within the Community Medicine (Preventive and Social Medicine) classes which is taught mostly in the pre final years of medical graduation. As such their knowledge regarding different aspects of BMW ought to be more recently updated as compared to the post graduates.
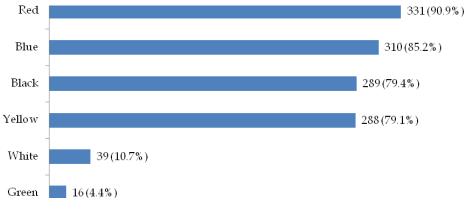

Fig: Awareness about different color codes used for BMW

Interestingly, this study also points out that there is no significant difference between the graduate and post-graduate groups regarding proper practice of BMW management (35-45%) indicating that the knowledge is limited mostly to theoretical aspect, in need of practical implementation. Wide range of results (0-75%) have been reported by different studies regarding proper practices of BMW management.[8-10]The significant association between knowledge and practice of BMW management illustrates that perhaps improved knowledge can reflect as accentuated practice. It is fascinating to imagine a knowledge threshold where theoretical knowledge transcends into practice. Probably, aspects of BMW need to be tutored more extensively and meticulously, or practical orientation may supplement the existent theoretical approach, or both. The fact that even respondents who had assessed their knowledge of BMW management on the higher side had admitted a need for training furthers the cause by justifying periodical refresher courses.

Few hospitals (both public and private) have made a limited duration BMW management training session compulsory for all doctors

when they join for the job. However, BMW segregation practices are noted as significantly better in private setups as compared to their public counterparts. Diving further in, practices differ significantly between graduates and postgraduates only in the public setups. Heavy workload in public hospitals could have caused a compromised practice; stringent hospital administration in private hospitals has, seemingly, led to more sincere BMW segregation practices leaving little room for volition.It generates mixed reactions that only around three out of five respondents were aware about the four color codes used for BMW management and two out of three knew that BMW has a 'biohazard symbol'.

CONCLUSION

Online studies need validation; however, they could be providing valuable hints. This study highlights the need for a balanced mix between effective practical training with meticulous theoretical aptitude building among medicos. This is necessary in the undergraduate medicalcurriculum and should be revisited through Continued Medical Education (CME)

sessions. Intelligent use of adult learning techniques and pedagogic skills may be made in this regard. Stricter implementation through the hospital administration along with work load reduction/ sharing may further supplement the endeavor.The high 'felt need' for biomedical waste management training among the respondent doctors has manifested in modest estimation of knowledge and practice. The fact that majority of the doctors vouched for training indicates their appreciation of the seriousness and importance of the issue – a gesture of reflex professionalism and commitment to population health.

REFERENCES

1. World Health Organization. Waste from health-care activities Fact sheet N°253 November 2011. Available at: http://www.who.int/mediacentre/factsheets/fs253/en/ . Accessed on Dec 14th, 2011.

2. Report of High Power Committee on Urban-Solid Waste Management, Planning Commission, Govt. of India, Hospital waste management 1995; 35-47.Available at: http://www.**planningcommission**.nic.in/**reports**/publications/pub95_hghpwr.pdf . Accessed on Dec 15th, 2011.

3. Grover P.D. Management of Hospital Wastes – An overview. Proceedings of National workshop on Management of Hospital Waste;1998:16-18

4. Ministry of Environment and forest notification on the Bio-Medical Waste (Management and Handling) Rules, 1998.Available at:http://www.env**for**.nic.in/legis/hsm/**bio**med.html . Accessed on Jul 23th, 2011.

5. Saini S,Nagarajan S S,Sarma R K. Attitude and Practices of Bio-Medical Waste Management Amongst Staff of a Tertiary Level Hospital in India. Journal of Academy of Hospital Administration2005;17(2):1-12. Available at: http://www.indmedica.com/journals.php?journalid=6&issueid=72&articleid=899&action=article . Accessed on Dec 15th, 2011.

6. Heckathorn D D. Respondent-Driven Sampling: A New Approach to the Study of Hidden Populations. Social Problems1997;44(2):174-199. Available at: http://www.respondentdrivensampling.org/reports/RDS1.pdf . Accessed on Dec 16th, 2011.

7. Abdul S A, Heckathorn D D, Sabin K, Saidel T. Implementation and Analysis of Respondent Driven Sampling: Lessons Learned from the Field. Journal of Urban Health: Bulletin of the New York Academy of Medicine 2006; 83(7): i1-i5.Available at:http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1705522/ . Accessed on Dec 24th, 2011.

8. 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(4):157-61.Available at: http://www.ncbi.nlm.nih.gov/pubmed/11307639 . Accessed on Dec 20th, 2011.

9. Mathur V, Dwivedi S, Hassan M, Misra R.Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel: A Cross-sectional Study. Indian J Community Med. 2011 Apr;36(2):143-5

10. Mostafa GM, Shazly MM, Sherief WI.Development of a waste management protocol based on assessment of knowledge and practice of healthcare personnel in surgical departments. Waste Manag 2009;29(1):430-9 Available at: http://cat.inist.fr/?aModele=afficheN&cpsidt=20918501 . Accessed on Dec 12th, 2011.

11. Akter N, Hussain Z, Trankler J, Parkpian P. Hospital waste management and it's probable health effect: a lesson learned from Bangladesh.Indian J Environ Health 2002;44(2):124-37.Available at:http://www.ncbi.nlm.nih.gov/pubmed/14503385 . Accessed on Dec 24th, 2011.

12. Sharma S, Chauhan SV. Assessment of bio-medical waste management in three apex government hospitals of Agra.J Environ Biol. 2008;29(2):159-62Available at: http://www.ncbi.nlm.nih.gov/pubmed/18831366. Accessed on Dec 14th, 2011.

13. Pandit NB, Mehta HK, Kartha GP, Choudhary SK. Management of bio-medical waste: Awareness and practices in a district of Gujarat. Indian J Public Health 2005;49:245-7.Available at:http://www.ncbi.nlm.nih.gov/pubmed/16479910 . Accessed on Dec 18th, 2011.

14. Rao PH. Report: Hospital waste management-awareness and practices: A study of three states in India. Waste Manage Res 2008;26:297-303.Available at: http://wmr.sagepub.com/content/26/3/297.abstract . Accessed on Dec 12th, 2011.

15. Mathew S S, Benjamin A I, Sengupta P. Assessment of biomedical waste management practices in a tertiary care teaching hospital in Ludhiana. healthline, 2011; 2(2):28-30.Available at:http://iapsmgc.org/OA7V2I2.pdf. Accessed on Dec 16th, 2011.

16. Yadavannavar MC, Berad AS, Jagirdar PB. Biomedical waste management: A study of knowledge, attitude, and practices in a tertiary health care institution in Bijapur. Indian J Community Med 2010;35:170-1

17. Cranston P, Davies T. Future Connect-A Review of Social Networking Today, Tomorrow and Beyond -An Analysis of the Challenges for AIDS Communicators. Available at: http://www.communicationforsocialchange.org/publications/future-connect?articleid=35. Accessed on Jan 2nd, 2012.

Correspondence:
Dr. ArchismanMohapatra
Resident, Department of Community Medicine,
Institute of Medical Sciences,
Banaras Hindu University,
Varanasi, Uttar Pradesh (UP)- 221005
E-mail: archismn@gmail.com