Volume – 11 Issue – 01
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JOURNAL OF THE
INDIAN SOCIETY OF
HOSPITAL WASTE MANAGEMENT

Picture

Highlights

- **Reducing Dioxin and Mercury emissions**
- **Hazards of Mercury usage**
- **Cytotoxic waste**
- **Patient safety**
- **Awareness of Dental health professionals**
- **Waste Sharps**
- **Best out of Waste**
- **Laboratory Waste**
- **Response from EMPRI towards capacity building**

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PRESIDENT'S PAGE

Esteemed ISHWM members,

It is good that ISHWM has been able to enter 12th year of its service to the country and profession. Looking back, we see ISHWM's attempt at information exchange in the ten annual conferences, ten Journals and participation of its members in various National and International pursuits in the area of health care waste management. These efforts are no small, but as fourth President of ISHWM, I wish to place before you couple of things for the honorable members to consider.

ISHWM needs to expand and have its units/branches across the country in every State and Union Territory. This I suggest that we expand establishing four Regional Chapters covering North, South, East and West over the next three years as a first step. I look upon to volunteers from amongst ISHWM members to spearhead this. There is need to advocate, talk to Government, Private and NGO partners in each of the regions for a year or two and establish the four chapters in one go by 2015. Once four regional chapters come up, I see probable cascading effect for State Chapters.

Effort to advocate to Government of India to consider ISHWM for technical inputs to all National Health Programmes (Now – National Disease Control programme) for providing inputs on designing HCWM, Infection Control and Patient safety areas is a necessity. This is mainly because ISHWM has strength and expertise to do this. Advocacy is required to showcase ISHWM and expertise of its members to Pollution Boards and Environment Departments –both at centre and states and union territories to involve ISHWM in advisory capacity to provide inputs. Similar advocacy is needed to influence various Health Professional Councils especially MCI, NCI, DCI.

Yet another area of advocacy is to influence Health Professional Universities, Associations of Hospital Administrators, Quality Council of India, NABH, NAC, etc. along with management of large Health Institutions. There is need to advocate, be proactive to influence Health Professional Universities and Institutions to initiate and strengthen postgraduate education and research in areas of HCWM, Infection Control and Patient Safety.

Multipronged approach is required to achieve these. If we ponder how we go about – three important steps become evident. Firstly, I call upon all members to initiate membership drive in their places of work, contacts, and their networks in their neighborhood. Secondly, I call upon Governing Council of ISHWM to strengthen ties with GOI, CPCB, WHO, UNIDO, UNDP, UNICEF, UNFPA. Thirdly, I call upon all ISHWM members to undertake areas of research in areas of HCWM, Infection Control and Patient Safety. I am confident that by incremental steps we should be able to achieve all these.

I am glad that Dr. V Narendranath CAO of M. S. Ramaiah Medical Teaching Hospital is providing necessary resources to bring out this issue. I thank Dr. S Kumar, President, Medical Education, Gokula Education Foundation and his team for taking responsibility of technical aspect of this Journal. I am glad that Dr. G. J. Qadiri, Principal and Dean, Yenepoya Medical College, Yenepoya University, Mangalore and team are providing opportunity for the release of this coveted Journal. I recall – if there is success anywhere, there is team effort.

Prof. (Dr) Ashok. K Agarwal
President, Indian Society of Hospital Waste Management

EDITOR'S PAGE

Dear Readers,

I am happy indeed that we were able to bring out Vol. 11, issue no 1 of Journal of ISHWM, Sep 2012. This would not have been possible without the support of contributors, readers, wonderful team of my colleagues, postgraduate students and friends. There is scope to enhance the quality, credibility and coverage of the journal by trying to bring out at least two issues a year and have the same indexed with leading agencies.. We like to realize this dream. We invite your cooperation for this – with contributions of research articles, articles related to development of best practices, information on trainings, book reviews, conferences and networking efforts. Sponsorships to enhance and bring out the Journal are much needed and your involvement in identifying sponsors is welcome and greatly appreciated.

Current issue focuses on seven important concerns – Management of **Household biomedical waste, Mercury** audit, **Cytotoxic drug** management, Management of **Laboratory waste,** Management of **Sharps** apart from important issues of **dioxins and furans**, **awareness** among dental health professionals. Another important communication is the self appraisal of attempts to develop an effective and good system in a Community Health Centre in Karnataka. I am sure readers will find it interesting. An analysis of this Journal by a reader and book review makes this Journal comprehensive**."Best out of waste"** provides food for thought to readers.

We had a very interesting experience during my visit to Chitradurga as a resource person for a training programme for Health and Family Welfare and Animal Husbandry Dept. Officers in Chitradurga on HCWM conducted by EMPRI . We were made to understand by DHO and FW Officer Dr. Mahalingappa and DPMO Dr. Kumarasawmy, that sensitization programmes on HCWM has been conducted in 102 out of 108 set ups as of date in the district. Taluk Health Officer Dr. Kashi at Hosadurga has initiated developing model systems of HCWM in 10 PHCs and 3 CHCs. Dr. Abinav, Medical Officer of CHC Parashurampura and Dr. Ranganath in his PHC are trying to make difference after IMEP training. It appears cascading effect visible. It was interesting to note that KHSRDP has initiated simple liquid waste management systems in PHCs and CHCs.

We noticed two more very interesting experiences. Environment Management and Policy Research Institute, Dept of Environment of Government of Karnataka has covered all 30 Districts in its three day TOT for District HCWM Cell members. It has covered three District level trainings in each of 17 Districts. Interestingly, they have tried to reach the Private sector as well as Dept of Animal Husbandry also. You will see some of their experiences shared in this issue of the Journal.

Dept. of Animal Husbandry led by Dr. Jayanna, Deputy Director at Chitradurga has shown interest and commitment to conduct waste survey, maintenance of Injury Register,

developing Protocol for segregation of BMW generated in veterinary institutions across the District. We look forward to sharing the learnings in our next issue.

We wish to dedicate the next issue of the Journal to **"best practices** "in health care waste management. Readers are invited to send articles /contributions before 1 of January 2013. Best practices may focus on:

- Management of HCWM in a sub-centre/PHC/CHC/District Hospital/Family practitioners/Dental Clinic/laboratory/Blood Bank/Radiology Department/Animal House,etc in low resource settings.

- Management of Glass/plastic/metal sharps/radiology waste/microbiology waste/blood bags/mattresses/mercury/lead, etc in low resource health care settings.

- Liquid waste management in small health care settings, alternative technologies, other issues like recycling of waste, management of general waste, etc.

Readers are requested to send articles /contributions before 1 of January 2013.
Formation of email group of readers, email group of members of ISHWM will be very useful. We suggest to all of you who are interested to join this to send your contact details to Editor in Chief, Journal of ISHWM hcwmcell@rediffmail.com. It will be a forum for dialogue/thought/introspection and Journal of ISHWM becomes more dynamic, interactive, we feel – with this effort. Also, if you wish to volunteer as a reviewer of research articles, kindly write to us.

We wish to acknowledge with grateful thanks support received from Dr. V Narendranath, Chief Administrative Officer – MSRMTH, Dr. N Girish, Additional Professor, Epidemiology, NIMHANS, Dr. SP Suryanarayana, Professor and HOD, Com Med, Dr. Saraswathi G Rao – Principal and Dean, MS Ramaiah Medical College, Dr. S Kumar-President, Medical Education, Gokula Education Foundation, MS Ramaiah Medical College and confidence imposed on us by Dr. AK Agarwal, President, ISHWM and Dr. KS Baghotia, Secretary, ISHWM, Governing Council and Editorial Advisory Board, Editorial team.

Resource for the publication of this issue has been mobilized by Dept of Hospital Administration, MS Ramaiah Medical College and Group of Hospitals. We gratefully acknowledge this valuable contribution.

Dr. S Pruthvish
Honorary Chief Editor, Journal of ISHWM,
Professor of Community Medicine, Chairperson – Health Care Waste Management Cell, Department of Community Medicine, MS Ramaiah Medical College, Bangalore 560 054, Karnataka, India,Mobile: 0091 9901042731, (o) 0091 080 23600968

RESEARCH ARTICLE

HOUSEHOLD BIOMEDICAL WASTE MANAGEMENT PRACTICES IN THE URBAN FIELD PRACTICE AREA OF BANGALORE MEDICAL COLLEGE AND RESEARCH INSTITUTE

Dr. Arun Mohan MV[@], Dr. Riyaz Basha S[#], Dr. Ravish KS[$], Dr. Nimmy Dominic[@], Dr. Shivaraj BM[@], Dr. Thilak SA[@], Dr. Ranganath TS[§]

ABSTRACT

Household biomedical waste is a neglected component of municipality solid waste, as it continues to be collected and disposed, mixed with the rest of solid waste. Lack of evidence of its quantum, composition and its health & environmental effects is to blame for this. This study was done to describe the types and disposal of biomedical waste generated at the household and to assess awareness regarding its hazards & disposal in an urban area.

Methods: A cross-sectional study was carried out in 150 urban households by personal interview using semi structured questionnaire.

Results: In 150 households surveyed, Medicines were the most common biomedical waste, present in 107 (71.3%) household, among which 68 (45.33%) had expired or unusable medicine. Other biomedical wastes produced were dressing material, sharps (injection needles & lancets), glucometer strips and body fluids (sputum). Only 18 (12%) were aware of biomedical waste. Majority said that they will segregate certain types of biomedical waste, 63% segregated medicine waste and main mode of disposal was into municipality waste bin/vehicle.

Conclusion: Willingness & actual segregation exists at source, but is being rendered useless by the absence of a separate collection. Awareness of hazards & management of biomedical waste is poor in the community.

Key words: Household biomedical waste; biomedical waste; household solid waste; municipality solid waste; segregation.

[@]Post-graduate, [#]Associate Professor, [$]Assistant Professor, [§]Professor and Head, Dept. of Community Medicine, BMCRI, Bangalore.

INTRODUCTION

Biomedical waste (BMW) is any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological, including categories mentioned in schedule I of the Bio-Medical Waste Rules 2011. The treatment of patients is not necessarily in healthcare institutions only, but also continues at their homes. Household solid waste includes among other things, the waste derived from domiciliary treatment of patients at their homes which is called household biomedical waste.[1] The hazards of biomedical waste have been well recognized and appropriate policies & actions are in operation for the management of such waste generated by healthcare related institutions in India, but a similar action is amiss for the management of biomedical waste generated at the household.[2] It is a well established fact that only a small proportion (10%) of the entire healthcare institutional waste is infectious, and if this small quantity is not segregated, it renders the whole waste produced by the institution, infectious.[3] In Bangalore, residential waste constitutes 52% of the municipality waste & around 1.2% (15.6 tonnes per day) of which is hazardous waste, which also includes biomedical waste (BMW).[4] The lack of a separate collection system for household BMW, means that it continues to get mixed with the rest of the 2,599 tonnes of municipality solid waste being produced each day in Urban Bangalore & probably contaminating the whole lot.[2]

With this current scenario of solid-waste mismanagement in Bangalore, forcing BBMP to revise its solid waste management strategies, data on household BMW would make a significant contribution to the new strategy.[5-7] Although one can deduce the composition of this household biomedical waste & its whereabouts, actual research & knowledge of the same is non-existent in India. This study hopes to fulfill a part of the knowledge gap and contribute to future household BMW management strategies.

OBJECTIVES

1. To describe the types and disposal of biomedical waste generated at the household in the urban field practice area of Bangalore Medical College and Research Institute.
2. To assess the awareness regarding the hazards & disposal of household biomedical waste among the people of the urban field practice area.

MATERIALS AND METHODS

This cross-sectional study was carried out in the urban field practice area of Bangalore Medical College & Research Institute in the month of October, 2011. One of the 4 sectors of the field practice area was chosen by simple random sampling. This was sector 1 which includes two areas, which are Doddamavalli & Shambupalya. To achieve a sample size of 150 households, from 850 households in this sector, every fifth household was chosen. After obtaining the required permissions, data was collected by a personal interview of the head of the family or in his/her absence any other adult of the family, of the selected household using a pre-tested, semi-structured questionnaire. A tested

Kannada version of the questionnaire was also used depending upon the choice of the interviewed.

Data regarding presence of 'potential' BMW & 'actual' BMW and its modes of disposal; and awareness regarding hazards & disposal of BMW were collected by interview as well as by inspection (wherever possible- example: inspection of medicines to ascertain the date of expiry, inspection of the bins at homes for presence of BMW).

Following definitions were used for the purpose of this study:

1. 'Potential' BMW: Substances which can become BMW after future use or disuse (in case of medicines) were taken to be 'potential' BMW. The presence of such substances at households at the point of survey was documented. Such substances included medicines (comprising tablets or capsule, tonics or syrups, & ampoules or vials), sharp wastes (like injection needles/lancets), dressing materials (like cotton & bandages), diapers & glucometer strips.

2. The 'actual' BMW comprised expired or disposed medicine, and all other used & disposed items like sharp wastes, dressing materials, diapers/sanitary clothes used for young children/elderly, & glucometer strips.

In our study, we also included sanitary pads or clothes used during menstruation and diapers/sanitary clothes used for young children/elderly, which are not included neither in the current nor the upcoming definitions of "biomedical waste" according to the Bio-medical waste rules 1998 & Draft of the bio-medical waste rules 2011 respectively.(1; 8)

DATA ANALYSIS

Data was analyzed using Epi Info 3.5.4 statistical software. The data was presented as proportions. Chi-square test and Fischer's exact tests were done to test the association between relevant variables. $P < 0.05$ was considered as statistically significant.

RESULTS

Table 1: Demographic data of the households

	Frequency (%)
Total households surveyed (N=150)	
Males	312 (49.2)
Females	322 (51.8)
Total people in the sampled households	634(100)
Type of family	
1.Nuclear family	95 (64)
2. Joint family	52 (35)
3. Three generation family	3 (1)
Total	150(100)

A total of 150 households were surveyed. There were 634 people in the households with an average family size of 4 people. The male: female sex ratio was 1: 1.03. Among the females, 55.3% (178) were in the reproductive age group (Table 1).

MORBIDITY PROFILE OF THE STUDY SAMPLE

Information regarding presence of diseases among household at the point of survey revealed that Diabetes Mellitus and Hypertension were the most common diseases, with Diabetes &/or Hypertension being present in 50 (33.3%) households. Diabetes was the single most common disease affecting 17 (20%) households. Eighty five (56.7%) households reported having at least one member suffering from some disease (Table 2).

Table 2: Morbidity profile of the households

Disease	**Frequency (%)**
Any disease	85 (56.7%)
Only Diabetes	17 (20%)
Only Hypertension	12 (14%)
Diabetes & Hypertension	21 (25%)
Others*	35 (41%)
* Others include Orthopedic/musculoskeletal conditions, cardiovascular diseases, sinusitis, migraine and 3 cases of pulmonary tuberculosis (TB).	

'POTENTIAL' BMW AND 'ACTUAL' BMW

Medicines (comprising tablets or capsule, tonics or syrups & ampoules or vials) were the most common **'**Potential' and 'actual' BMW**.** Medicines were present in 107 (71.3%) household, among which 68 (45.33%) households had expired or unusable medicines. Dressing materials (like cotton or bandages) were present in 11 (7.3%) households either as part of 'first aid kit' or following its past use (for post-trauma/surgery wound management and diabetic ulcers), as during the point of survey none were using it, hence it did not contribute to 'actual' BMW. Of 17 (7.3%) households which had sharps (injection needles & lancets), 14 (9.3%) produced sharp wastes on the day of survey visit. Glucometer strips were present in 9 (6%) households, of which 3 (2%) had used them on the day of survey. Females in the reproductive age group were present in 127 (55.3%) households who were a potential source of BMW in the form of sanitary pads or clothes used during menstruation. Seven (4.6%) households had women who were menstruating at the point of survey. The 3 TB patients were source of BMW in the form of body fluids (sputum). Any form of 'potential' or 'actual' BMW (Diapers/sanitary clothes used for young children/elders and Sanitary pads/ clothes used during menstruation excluded) was present in 114 (76%) households, with the inclusion of Diapers/sanitary clothes used for young children/elders and Sanitary pads/ clothes used during menstruation, this count goes up to 144 (96%) households. Presence of disease in the household was significantly associated with the presence of biomedical waste (excluding diapers/sanitary clothes used for young children/elders and Sanitary pads/ clothes used during menstruation) (Fischer's

exact test, P = 0.026, at 95% Confidence interval) but not with biomedical waste inclusive of diapers/sanitary clothes used for young children/elders and Sanitary pads/ clothes used during menstruation (Fischer's exact test, P = 0.698) (Table 3).

KNOWLEDGE OF GENERAL WASTE MANAGEMENT

Although 136 (90.7%) people said that it is important to properly dispose general waste, the technique of proper disposal was known by only 80 (53.3%) people. Majority i.e. 122 (81.3%) people knew that improperly disposed general waste could cause health hazard.

Awareness of segregation of hazardous & biomedical wastes: When asked to quote examples of high risk waste in the household waste, 13 (8.7%) people quoted examples of hazardous waste, 20 (13.3%) of biomedical wastes & only 2 (1.3%) people quoted both these.

KNOWLEDGE, ATTITUDE AND PRACTICES REGARDING BIO-MEDICAL WASTE MANAGEMENT

Although 29 (19.3%) had heard the word "Biomedical Waste", only 18 (12%) of them could quote at least one example of the same. Those who had both heard as well as could quote an example were considered aware of BMW. After eliciting this information, all the interviewed were explained the constituents of BMW & asked whether it can transmit certain diseases. Ninety eight (65.3%) interviewed said that BMW can transmit illness or disease in general, 52 (34.7%) said that it can transmit Hepatitis B, and 49 (32.7%) said that it can transmit HIV.

Attitude towards segregation of 'potential' BMW was assessed. It was observed that majority of the households said that they will segregate medicines, diapers/sanitary clothes, body fluids & menstrual sanitary pads/clothes. Whereas less than half of the households were willing to segregate sharp wastes, dressing materials & glucometer strips. All those households which said that they would segregate, said that they would collect BMW in separate plastic bags or covers. The 3 TB patients were aware of cough etiquette & sanitary sputum disposal, and reported abstinence from indiscriminately spitting (Table 3).

Segregation practice of 'actual' BMW was observed & assessed. Of 68 households having medicine wastes, 43 (63%) segregated them. Diapers/sanitary clothes was segregated by 20 (80%) of the 25 households that produced them. All 7 households that produced sanitary pads/clothes used during menstruation segregated them. The mode of segregation of these BMW, if the disposal was into municipality waste bin/vehicle was in plastic bags or covers, with the exception of 2 households which packed the sanitary pads in old news-papers (Table 3).

Table 3: 'Potential' & 'actual' BMW present at the time of survey and the attitude & practices of its segregation

Type of waste	Households with potential BMW (% of households)	Households with potential BMW who said that they will segregate (% of the households with the potential BMW)	Households with actual BMW (% of households)	Households with actual BMW segregating (% off the households that produce it)
Medicines	107 (71.3%)	71 (66.4%)	68 (45.3%)	43 (63%)
1.Tablets/Capsules 2. Tonics/Syrups 3. Ampoules/Vials	105 (70%) 44 (29.3%) 8 (5.3%)		66 (44%) 25 (16.7%) 0 (0%)	
Dressing material (cotton / bandage)	11 (7.3%)	5 (46%)	0 (0%)	-
Sharps- Injection Needles/Lancets	17 (11.3%)	8 (47%)	14 (9.3%)	0
Glucometer strips	9 (6%)	2 (22%)	3 (2%)	0
Body fluids	3 (2%)	3 (100%)	3 (2%)	0
*Diapers/sanitary clothes used for young children/elders	25 (16.7%)	20 (80%)	25 (16.7%)	20 (80%)
* Sanitary pads/ clothes used during menstruation	127 (84.7%)	101 (80%)	7 (4.6%)	7 (100%)
* Are not included in the current nor the upcoming definition of "biomedical waste" according to the Biomedical waste rule 1998 & Draft of the biomedical waste rule 2011 respectively(1; 8)				

DISPOSAL PRACTICES

Disposal of BMW was assessed among all households with both potential & actual BMW. Almost all household BMW was disposed off into municipality waste bin/vehicle, few households also disposed off their waste medicines, diapers/sanitary clothes, menstrual sanitary pads/clothes into sewage system or indiscriminately threw it out of their homes. None of them used puncture proof boxes/containers for segregating sharp wastes. One of the households reported that the tablets/capsules were dissolved in water & poured to their potted plants. One household reported that their menstrual sanitary pads/clothes were burnt. The 3 TB patients were spitting out sputum directly into the toilets. None of them practiced decontamination of sputum.

Table 4: Disposal practices of household BMW

Type of waste	Mode of disposal- Number of houses (percent of households that had the 'potential' & 'actual' BMW, disposing by this mode)		
	Municipality Waste bin/vehicle	Sewage/Sullage	Thrown out
Medicines			
1. Tablets/Capsules	95 (90.5%)	2 (1.9%)	8 (7.6%)
2. Tonics/Syrups	38 (86.4%)	3 (6.8%)	3 (6.8%)
3. Ampoules/Vials	8 (100%)		
Dressing material (cotton / bandage)	11 (100%)	0	0
Glucometer strips	9 (82%)	0	2 (18%)
Body fluids		3 (100%)	
* Diapers/sanitary clothes used for young children/elders	23 (92%)	2 (25%)	0
*Sanitary pads/ clothes used during menstruation	115 (90.6%)	4 (3.1%)	7 (4.7%)
* Are not included in the current nor the upcoming definition of "biomedical waste" according to the Biomedical waste rules 1998 & Draft of the biomedical waste rules 2011 respectively. (1; 8)			

DISCUSSION

The study population comprised of households with a population which had a reversed sex ratio compared to the country (India) or state (Karnataka), and even among females who were a majority, more than half were in the reproductive age group[9]. This could explain the large proportion of menstrual sanitary pads/clothes, every month irrespective of the presence of any disease. One third of the households had diabetes &/or hypertension. High prevalence of such chronic diseases & the presence of large number of women in reproductive age group and their children, contributed to the presence of medicines and expired medicines in two thirds and nearly half the households respectively. The high prevalence of diabetes also resulted in generation of sharp wastes (insulin syringe needles & glucometer strips).

Majority knew the importance of proper disposal of general waste & that it can pose a health hazard, but only half the households knew the correct technique of general waste disposal. Even with low awareness regarding BMW and its segregation, more than half the household were willing to segregate certain types of waste, but they were not willing to segregate sharp wastes, dressing materials & glucometer strips. Most households segregate medicines & diapers, and all segregate menstrual sanitary pads/clothes. Segregation is mostly being done in separate plastic bags/covers. The main mode of disposal was into municipality waste bins or collection vehicles, although some of them disposed into sewage system or indiscriminately by the roadside. Although certain BMW

is segregated by households, the absence of a separate collection system by the municipality renders this activity useless, & BMW ends up mixed with other waste contaminating the whole lot.

CONCLUSION

Biomedical waste is being produced from most homes, more so with the presence of diseased individuals in the household. Medicines are the most common household biomedical waste. More than half the households are willing to segregate biomedical waste, and most are already segregating certain types of this waste. This segregation at source is being rendered useless by the absence of a separate collection system by the municipality & it ends up mixed with other waste. Awareness of the hazards & management of biomedical waste is poor in the community. Improvement in the knowledge of household waste management in the community and implementation of a functioning system for its proper management is the need of the hour. Since the quantity of household biomedical waste is not as enormous as the rest of the solid waste, the municipality could implement with little effort or expense, separate collection of this waste. Certain types of this household BMW like sharps may even be collected safely once a week in puncture proof containers. The household BMW so collected can then be safely disposed along with already existing healthcare institutional BMW management setup.

The segregated household biomedical waste can be collected in separate bins along with the general municipal waste and handed over to the already functioning and unhindered BMW treatment facilities. The local authorities can take all necessary measures for developing a model municipal ward for management of household biomedical waste and experiences from this can be utilized for wider implementation across the country.

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RESEARCH ARTICLE

REDUCING DIOXIN AND MERCURY EMISSIONS FROM HEALTH CARE WASTE - A GEF- UNDP INTITAIVE

Prof A.K Agarwal[@] and Dr. Megha Rathi[#]

ABSTRACT

Dioxins and mercury emissions from health care facilities are a major environmental and health challenge. Substantive steps need to be taken to reduce these emissions by waste minimization, environmentally safe alternatives and in-house management of waste in the health care facilities. The GEF- UNDP project "Demonstrating and Promoting Best Techniques and Practices for Reducing Health Care Waste to Avoid Environmental Releases of Dioxins and Mercury" is a global project being implemented in eight countries and addressing these major challenges. The implementation experiences shared by the project nationally and globally are models for others to replicate. A major focus of the project in India has been capacity building of Health Care professionals at King George Medical University, Lucknow and a number of health care facilities and a Common Treatment facility in Tamil Nadu.

INTRODUCTION

The health care sector is expanding enormously and this has resulted in generation of large quantities of waste and emissions of by-products and toxic substances into the environment. The most hazardous by-products known from medical waste are dioxins and furans and contamination by heavy metals like mercury.

Incineration and open burning of healthcare waste are the main sources of dioxins in healthcare, and are major sources of mercury pollution. "Dioxins" are a group of both polychlorinated di-benzo-p-dioxins and polychlorinated di-benzofurans, compounds representing 210 highly toxic and persistent chemicals that are unintentional by-products of medical waste incineration. Dioxin has been linked to cancer, effects on the immune system, reproductive and developmental disorders, and hormone disruption.

While Mercury has been used over centuries in the health care sector, but due to its potent neurotoxin nature that can affect the brain, spinal cord, kidneys and the development of children mercury needs to be phased off from the health care facilities at a faster pace.

These harmful contaminants are omnipresent as they are transported globally on air currents and by other means; they are toxic in small quantities; they bio-accumulate up the food chain; and they have caused documented harm to public health and the environment at locations far from the original source of their release.

[@]Professor (Retd.) at School of Health Sciences, IGNOU and Principal Investigor (IGNOU), GEF- UNDP project on Health Care Waste Management, New Delhi

[#]Health care waste management consultant and National technical advisor to the GEF- UNDP project on Health care waste management, New Delhi

Incineration and improperly handled mercury spills are not the only problems with medical waste treatment, however. Very often it has been seen that the medical facilities large, medium or small, urban or rural, do not manage their waste effectively and discard their medical waste with regular municipal waste, which risks the spread of diseases especially among the health care personnel's waste handlers and communities due to needle prick injuries and reuse of contaminated injections. The Discarded needles and syringes, may result in the spread of blood borne pathogens such as HIV/AIDS and hepatitis. Studies have shown that more than 60 people lost their lives in 2009 due to hepatitis B outbreak in Gujarat because of improper trafficking of medical waste.[1]

To contain the spread of infections and harmful emissions from incineration United Nations Development Programme (UNDP) and Global Environment Facility (GEF) together launched a global project across eight countries Philippines, Vietnam, India, Argentina, Senegal, Tanzania, Latvia and Lebanon titled "Demonstrating and Promoting Best Techniques and Practices for Reducing Health Care Waste to Avoid Environmental Releases of Dioxins and Mercury". Globally the project aims at reducing the dioxin levels and mercury usage in the health care facilities and demonstrating use of alternative non- burn treatment options for safe disposal of waste.

OBJECTIVES OF THE PROJECT

1. Establish model facilities and programs to exemplify best practices in healthcare waste management.
2. Deploy and evaluate commercially available, non-incineration healthcare waste treatment technologies appropriate to the needs of each country.
3. Introduce and evaluate the use of mercury-free devices in model facilities.
4. Establish or enhance training programs to build capacity for the implementation of best practices and technologies both within and beyond the model facilities and programs.
5. Review and update relevant policies.
6. Disseminate project results and materials to stakeholders and hold conferences or workshops to encourage replication.
7. Make project results on demonstrated best techniques and practices available for dissemination and scaling-up regionally and globally.

INDIAN COMPONENT OF THE PROGRAM

India has been leading the efforts of developing countries in implementing safe health care waste management practices. The gazette on bio- medical waste management was framed way back in 1998 and since then there have been different efforts to strengthen the waste management systems in the country. The GEF- UNDP project is yet another milestone in these efforts and it has been able to create a substantial impact in waste management practices and models for waste management in the health care facilities and the CTFs with training and awareness on health care waste management being the key

element towards safe management of waste in the health care facilities. The efforts of implementing the project in the country have been lead by the Ministry of Environment and Forest jointly with the Global Project Team by guiding the partners towards meeting the project objectives.

The project implementation in India focuses on three components:

1. **Developing Tamil Nadu as a model state** by strengthening the activities of a centralized waste treatment facility and holistically looking at creating best waste management practices of the cluster of health care facilities catered by the centralized facility.

2. **Creating model hospital in Lucknow, Uttar Pradesh** which will focus on creating a model health care facility which will be an example for the other facilities in the region to duplicate and endorse best practices in healthcare waste management.

3. **IGNOU's training program and Training of Trainers (TOT) Workshops**: A unique component to India is the IGNOU's distance learning program on health care waste management which has been integrated as a part of the project to upgrade the national health care waste management training programs and focus on the training needs of the project partners. Further IGNOU has been entrusted with responsibilities to conduct ToT workshops training on mercury hazards and phasing out of mercury devices and also to evaluate the impact of these training activities.

THE TAMIL NADU COMPONENT OF THE PROJECT

The state of Tamil Nadu was chosen under the project as it already has a rich set of ongoing HCWM programs/activities in state including the World Bank-funded State Health System development project, which has a substantial HCWM component and the CBWTFs are well-established in Tamil Nadu. To further strengthen the waste management systems in the state the following project partners were selected - Tamil Nadu Pollution Control, Tamil Nadu Health Systems, IMA, 15 Health care facilities(HCFs) and a centralized waste treatment facility (CTF) G.J. Multiclave Pvt. Ltd.

A baseline survey of the current waste management practices in the selected HCFs and the CTF was undertaken and on the basis of the baseline survey the activities were planned in the state. The findings of the baseline survey are listed below:

1. There was mixing of waste,
2. The colour coding for waste containers was not uniform,
3. Sharps were not handled properly, with various practices of recapping and disposal with regular trash.
4. Plastics were incinerated resulting in dioxin formation.
5. Waste collection and transportation was not appropriate and
6. There was no regular training and monitoring for HCWM.

7. Mercury was used extensively in the sphygmomanometers and thermometers.

ACTION AGENDA UNDER THE PROJECT:

1. Towards the 1st steps to make Tamil Nadu a model state, HCWM systems were standardized by introducing uniform colour coding and sharps collection in the selected HCFs.

2. To stop pilferage of medical waste a waste tracking software was introduced from the point of generation in the HCFs to final disposal in the CTF, also GPS systems were fit in the CTF transportation vehicles to ensure safe transportation of waste.

3. At the CTF non- burn waste treatment technologies – autoclaves and shredders were provided to treat waste and on line gas analyzers were fixed to the incinerator for constant monitoring of the flue gas emissions by the state pollution control board.

4. Mercury devices have been replaced with non- mercury devices in the HCFs and the unused mercury based devices are temporarily stored safely till the PCB comes with a final storage and disposal option.

MODEL HEALTH CARE FACILITY AT LUCKNOW

King George Medical University a more than 100 year old, 3000 bedded medical teaching hospital was chosen as a model HCF under the project. A baseline survey was conducted to assess the situation of waste management in the institution to help in planning the project activities in the institution. The findings of the baseline survey were:

1. Barely any segregation at the point of generation and all the categories of waste were being mixed together.

2. There was no infrastructure, lack of knowledge and a sheer lack of commitment towards waste management.

3. The University had tied up with a waste disposal company for final treatment and disposal of waste, the visit to the facility showed that all the waste was either incinerated or handed over to sub contractors.

4. There was also a significant risk from improper waste management practices to the health care workers, waste sorters, and community at large, besides significantly contributing to an increased burden of incinerable waste.

ACTION TAKEN UNDER THE PROJECT:

With the project implementation since 2010 significant changes can be attributed to the waste management process in the medical university.

1. The magnitude of incinerable waste has significantly decreased to less than 4 %, autoclavable waste is around 16% and general trash is around 80%.

2. By virtue of segregation at point of generation and further segregation of autoclaved plastic waste, the institution has started generating revenue, which offsets the costs incurred for disposal of biomedical waste by approximately 25% currently.

3. A step wise planned and phased project implementation has helped KGMU in achieving the current standards of waste management.

4. Systematic waste collection and transportation of waste has contributed to cleaner environment in the wards, corridors and surroundings of the institution.

5. The institution is set to be a model with also instituting mercury phase out and supplementing non- mercury devices.

6. The institution has developed a dedicated central waste collection and treatment site (CCTS) hosting waste autoclaves and shredders. The CCTS has been designed in such a manner that at no point infectious and non- infectious waste get in contact with each other. The autoclaved waste is segregated into different kind of plastics and shredded and sent for recycling. The incinerable waste is sent for incineration and general waste is mixed with municipal waste for disposal by the local municipal authorities.

7. These systems are sustained in the long term with IGNOU's regular training, monitoring and a waste tracking software system with the constant support from the waste management cell and brigade of dedicated Health Care Functionaries from the vice chancellor to the waste handler. Like Tamil Nadu IGNOU has conducted two ToTs and one mercury workshop.

IGNOU'S TRAINING PROGRAMMES

Lack of knowledge and attitude towards waste management has been the main factor in non compliance of the bio- medical waste rules in the country. As the training partner to the GEF- UNDP project Indira Gandhi National Open University (IGNOU) has contributed significantly towards providing training and awareness to the project partners in Tamil Nadu and Lucknow, UP. IGNOU with its vast experience on training and its six-month's certificate program in HCWM, specialized ToT (training and trainers) programs, workshops and hands on training program has helped in enabling the project partners with rich knowledge and skills on HCWM.

The requirements of the project partners were examined and specialized programs and modules were prepared to cater to their needs. More than 100 learners across the two project partners have been enrolled under the unique six- month's certificate program offered by IGNOU. These learners were selected and nominated by the participating HCFs and the CTF. To further boost the skills on HCWM five ToT programs with hands

on training at the Health care facility and the CTF supplemented with lectures and tutorials, knowledge assessment and pre and post test on HCWM were organized in Chennai and Lucknow.

Fig 1: Visit to the CTF as part of the IGNOU ToT program

As a project objective IGNOU organized Mercury phase out and sensitization workshops in Chennai and Lucknow in consultation with Toxics Link and other national and international experts. The awareness generated during the workshop on the hazards of mercury provided the necessary platform for mercury elimination program under the project.

Fig 2: Demonstration of waste segregation practices

Fig 3: Mercury awareness workshop in Chennai

Based on the ToT programs and six- months certificate program organized by IGNOU the identified trainers under the project have further taken up training sessions for various health care professionals and employees in their HCFs. In KGMU alone around 90 training sessions have been taken up by their staff and more than 2000 employees have been trained over the last 2 years. IGNOU undertook the final evaluation of the training impact at KGMC, Lucknow with the help of a questionnaire. It revealed a substantial enhancement of knowledge and skill of the staff.

IGNOU's six- months certificate program and training sessions is an ongoing program, irrespective of the project. These training programs have to be taken up regularly by the HCFs to ensure environmentally safe health care waste management practices.

CONCLUSION:

At present, there are 95216 HCFs in the country and only half of them are having some system of waste management. A major boost is needed to transform the current HCWM scenario in the country, with joint effort by different stakeholders to create a larger impact in a country with over a billion population. The UNDP- GEF project is a step forward towards implementing healthcare waste management practices in the country. A systematic and planned implementation of the project with constant training and monitoring has resulted in significant improvement in the HCWM practices in the HCFs. These models and similar efforts need to be replicated further to boost the health care waste management system in the country.

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RESEARCH ARTICLE

MERCURY QUANTIFICATION AND KNOWLEDGE REGARDING HAZARDS OF MERCURY USAGE AND SPILL MANAGEMENT AMONG STAFF IN A TERTIARY CARE HOSPITAL IN BANGALORE

Vivekananda Bhat[@], Gautham M S[#], Hemanth Thapsey[$], Narendranath V[§], Srinath M G[€], Pruthvish S[¥]

ABSTRACT

Introduction: The hazards of mercury are being recognized globally, particularly its role as a health hazard risk due its continued presence in health care settings in form of mercury-containing equipment. The United Nations Environment Programme (UNEP) and World Health Organization (WHO) have identified mercury as a serious global environmental and human health problem and have called for phasing out of mercury. Currently there is limited evidence in Indian settings regarding the quantum of usage and knowledge of health care personnel about hazards of mercury and its spill management. **Objectives:** To assess the mercury quantum in a tertiary care hospital and assess awareness among health care staff regarding mercury hazards and spill management. **Materials and methods:** A cross sectional study was conducted in a tertiary care hospital in Bangalore for duration of 2 months using observational and interview technique to quantify mercury usage and assess knowledge levels amongst the nurses and interns. **Results:** 2 main sources of mercury were sphygmomanometers and thermometers, accounting for a total mercury load of 13kg. More than 90% subjects scored more than 50% in knowledge level scoring on mercury and its health hazards. Theoretical knowledge about mercury spill management was good, but the same was not applied to practice. Presence of mercury free substitutes was known to only a few. **Conclusion:** Mercury is still largely used in the tertiary hospital. Health care workers must be trained in proper handling of mercury spills and be made aware regarding the health hazards of mercury.

Keywords: Mercury, quantum, tertiary hospital, Bangalore

[@] MBBS student, M S Ramaiah Medical College, Bangalore
[#] Assistant Professor, Epidemiology, National Institute of Mental Health & Neuro Sciences, Bangalore
[$] Associate Professor, Community Medicine, M S Ramaiah Medical College, Bangalore
[§] Hospital Administrator, M S Ramaiah Teaching Hospital, Bangalore
[€] Senior Professor, Radiology & Ex-President, M S Ramaiah Memorial Hospital, Bangalore.
[¥] Professor, Community Medicine, M S Ramaiah Medical College, Bangalore

INTRODUCTION

The hazards of mercury exposure are now being recognized globally, particularly as a health hazard to health care personnel. Hazards due to mercury in healthcare units is due to widespread use of mercury-containing equipments and from accidental spills that can occur, which further increases the risk of various hazards resulting due to acute and chronic exposures. The United Nations Environment Programme (UNEP) and World Health Organization have identified the adverse effects of mercury pollution as a serious global environmental and human health problem.[1,2] With ever increasing population and hospitals, it becomes very pertinent that health care providers organize the waste generated in such a manner that the health of health care staff, patients and environment is safeguarded.

Most of the health care facilities in India still utilize mercury containing devices and are scattered throughout the length and breadth of the country. There is a need for evidence regarding the extent and quantum of mercury usage in hospitals and awareness levels & practices of the health staff regarding the same. This calls for an inventorisation survey that will provide baseline information, which will subsequently help in monitoring and evaluation of strategies and pace our progress towards achieving "mercury free" health care settings.

MATERIALS AND METHODS

This cross sectional survey for duration of 2 months was conducted in a reputed 1156 bedded tertiary care hospital which is also an academic institute. For this study 95 interns and 714 staff nurses were included to assess knowledge levels. The study was ethically cleared by the Institute's ethical review board. Permission was obtained from Principal and Dean and Hospital Administrator to conduct of the study. Informed verbal consent was obtained before administering the questionnaire. Data was collected using a pretested semi-structured questionnaire cum observational checklist

The questionnaire consisted of:

- Part A: Items pertaining to inventorisation and quantification of mercury usage.
- Part B: Items pertaining to assessment of knowledge levels regarding mercury hazards and mercury spill management.

SCORING OF AWARENESS AND PRACTICES

Various items were used to assess knowledge and practices of nurses and interns towards mercury hazards and mercury spill management. The questionnaire included 14 questions on instruments specially focusing on devices containing mercury, breakage and mercury spills, records to document spills, action taken during a spill, availability of spill management kits, substitutes for mercury based equipments, impact on health, individuals most vulnerable to exposure and opinion regarding measures taken to be free of mercury hazards etc. Each correct response was awarded a score of 1 and each incorrect response was awarded a score of 0. The final individual score levels for awareness/knowledge level was (Score obtained/ max score possible) X 100.

QUANTUM ASSESSMENT

An inventorisation of mercury containing equipment and standard mercury content per unit of equipment (as mentioned by manufacturer) multiplied by number of equipments identified in the hospital was done to arrive at quantum of mercury in the hospital.

RESULTS

64 units were studied which included OPDs, wards, Labour room, ICUs, Store etc. Mercury containing equipments were present in all 64 units of study. Questionnaires were handed out to all 714 nurses and 95 interns. 615 nurses (86.13%) and 92 interns (96.84%) returned the filled questionnaires. 2 major sources of mercury identified in the hospital were sphygmomanometers and thermometers.

Table 1: Quantum of mercury in the hospital

	Sphygmomanometer	**Thermometer**	**Total**
Number	175	266	--
Quantum of mercury per unit of equipment	73g	1g	--
Total Quantity of mercury(g)	12775g	266g	13041g
Mercury/unit of hospital	199.6g/unit	4.15g/unit	203.7g/unit
Mercury quantum/bed	11.05g/bed	0.23g/bed	11.28g/bed

There were a total of 175 Sphygmomanometers present from 64 units of study in the hospital. Mean Sphygmomanometer per unit was 2.73. The amount of mercury in each Sphygmomanometer was observed to be 73g. The total mercury load from all sphygmomanometers in the hospital was 12.77kg. Mercury from Sphygmomanometer per unit of hospital was 199.6g. Sphygmomanometer contributed to a mercury quantum of 11.05g/bed.

There were a total of 266 thermometers from 64 units of study in the hospital. Mean thermometer per unit was 4.15. The total mercury load from all thermometers in the hospital was 266g. Mercury per unit of hospital from thermometer was 4.15g. Thermometer contributed to a mercury quantum of 0.23g/bed.

The total mercury load from the hospital was: **13041g = 13kg**

Table 2: Comparison of knowledge levels of nurses and interns on mercury and spill management

Item	Nurses	Interns
	Yes n(%)	Yes n(%)
Mercury spills when mercury containing instruments are broken?	615(100)	92(100)
Are there any records to document mercury spills?	409(66.5)	12(13)
Does mercury evaporate on spilling?	204(33.2)	71(77.2)
Mercury spill management kits available in your centre?	478(77.7)	35(38)
Is there any substitute for mercury based instruments?	371(60.3)	71(77.2)
Does mercury have any harmful effect on health?	483(78.5)	60(65.2)

It was encouraging to note that all nurses and interns were affirmative of the fact that mercury spilled when instruments were broken, but only 66.5% of nurses and 12% of interns knew about records to document spills. Most of the nurses (77.7%) knew that mercury spill management kits were available and that mercury had harmful effect on health (78.7%). Very few interns (35%) knew mercury spill management kits were available and harmful effect of mercury on health was known to 60%. Only 33.2% of nurses knew that mercury evaporates on spilling, whereas 77.2% of interns knew about this. 60.3% of nurses and 65.2% of interns knew that there existed alternatives for mercury based instruments.

Majority of nurses (93.5%) and interns (83.7%) believed that medical professionals are most vulnerable to mercury exposure.

Total knowledge score was 8. Mean knowledge scores of nurses was (5.09 ± 0.95) (Mean±SD) was better as compared to interns (4.71 ± 0.859) (Mean±SD). Among nurses, 91.9% had scores more than 50%, 94.6% of interns had scores more than 50%. This difference of knowledge of mercury awareness between the 2 groups was not statistically significant.

Table 3: Actions taken for management of spill

Item	Nurses	Interns
	Yes n(%)	Yes n(%)
Sweep with broom	16(2.6)	0(0)
Collect in dust bin with other wastes	8(1.3)	1(1.1)
Collect in a separate container	572(93)	92(100)
Drain in sewerage system	22(3.6)	2(2.2)
Clean with vacuum cleaner	46(7.5)	2(2.2)
Wipe with cloth mop	36(5.9)	4(4.3)
Do nothing	8(1.3)	1(1.1)
Others	7(1.1)	0(0)

Majority of nurses (93%) and all the interns knew that the most appropriate action taken during a mercury spill was to collect spilled mercury in a separate container. These perceptions which are favorable are present in most nurses and all interns; however, training is required to increase the same.

Table 4: Opinion on measures to be taken to be free of mercury hazards

Item	Nurses	Interns
	Yes n(%)	Yes n(%)
Use alternatives	109(17.7)	8(8.7)
Ban mercury containing instruments	38(6.2)	4(4.3)
Use measures to prevent breakage of instrument while handling	312(50.7)	43(46.7)
Develop Government policy	6(1)	3(3.3)
Increase awareness of mercury hazards	262(42.6)	17(18.5)
Provide training in handling mercury	300(48.8)	17(18.5)

About half of nurses and interns believed that proper handling of instruments would reduce their risk to mercury exposure. Using of alternative non-mercurial instruments was opined only by 17.7% of nurses and 8.7% of interns. Majority i.e. 42.6% of nurses and 18.5% of interns believed increasing awareness of health hazards of mercury was most appropriate method, whereas 48.8% of nurses and 18.5% of interns believed providing training to proper handling of mercury spills was the best measure to be free of mercury hazards.

DISCUSSION

This cross sectional study has revealed certain interesting observations. In spite of global awareness to reduce mercury usage, mercury is still widely used in the tertiary care hospital. The probable continued use of mercury containing devices may be attributed to higher cost of alternative non-mercurial devices.

We observed in 64 units of hospital that there were 175 Sphygmomanometer and 266 thermometers, which were the two main sources of mercury in the hospital. Mean Sphygmomanometer per unit was 2.73. Mercury load from Sphygmomanometer was 12.77kg. Mean thermometers per unit was 4.15. Mercury load from thermometers was 266g. The total mercury load from the hospital was about 13kg.

Although the hospital maintained a register to document spills, only 66.5% of nurses and 13% of interns knew about it. Hospital also provided a kit along with Bio-medical hazard kit to manage mercury spills, it was known only to 77.7% of nurses and only 38% of interns. There is a gap at level of both monitoring and implementation because although the administration had has put in place a system of recording and made available kits; same has not been percolated among interns and nurses.

On interviewing with the nursing staff about the spill kit and also on inspection of the spill kit, it only contained 2 x-ray films for managing spills. Other components of the kit

were to be sourced from different places of the ward. Thus, although a mercury spill management kit was said to be present, it was inadequate as prescribed by Health Care without Harm (HCWH) to manage a spill.[3] The kit did not have directions on proper directions regarding steps of managing a mercury spill.

It was noted that 93% of nurses and all the interns believed that the most appropriate method of mercury spill management was to collect it separately in a container. This practice is in accordance with mercury spill management guidelines given by Health care Without Harm(HCWH) and Health and Environment Alliance (HEAL).[4]

The WHO policy paper on Mercury in Health care has stated that mercury is a potential occupational hazard and medical professionals are at higher risk of mercury exposure.[5] Majority i.e. 93.5% of nurses and 83.7% of interns believed medical professionals were at more vulnerable to mercury exposure**.**

It was noted that only 60.3% of nurses and 77.2% of interns knew about alternatives to mercury based instruments when a variety of mercury free equipments are available for substitution. About 78.5% of nurses and 65.2% of interns knew that mercury posed as a health hazard, many had the knowledge that mercury was poisonous, but could not mention which specific disease or which system mercury could cause harm. A majority however were concerned about discolouration of jewellery than health.

From the scores of awareness and practices, we observe that the mean scores of nurses' i.e. 5.09 are better than interns i.e. 4.71. Nurses are working constantly day in and day out and thus possess more experience whereas interns rotate postings every month and a fresh batch of interns replace existing once every year. Thus whatever knowledge interns possess is only theoretical from their curriculum and not from practice.

Among nurses, only 8.1% had scores less than 50%, 5.4% of interns had scores less than 50%. This difference of mercury awareness between the 2 groups was not statistically significant.

There is a need to include these aspects in internship orientation programme before the commencement of hospital duties. Nurses also must be trained about mercurial hazards and spill management. This training must be re-inforced frequently and spill management practices must be monitored, so as to suitably rectify wherever possible.

All opinions expressed by the study group on measures to be free of mercury hazards fall under short, medium and long term measures as instituted by WHO in its policy paper on measures for mercury free health care.[5] Institutions must plan towards phasing out mercury and substituting with mercury free alternatives, but until such an action is taken, raising the awareness levels among health care personnel on health hazards of mercury and its spill management seems to be best possible measure.

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INTROSPECTION

CYTOTOXIC DRUG DISPOSAL: URGENT NEED FOR GUIDELINES

Kirti Srivastava[@], Anuradha Nischal[#], Anupam Wakhlu[$], Anshita Singh[§]

ABSTRACT

Cytotoxic drugs are increasingly being used in the healthcare facility (HCF) to treat various malignant and non-malignant conditions such as cancer, rheumatoid arthritis, multiple sclerosis, psoriasis, systemic lupus erythematosus and some ophthalmic conditions. Cytotoxic drugs kill cells and are mutagenic in nature and therefore need special handling and proper disposal. The hazards related to cytotoxic drugs are greatly neglected and the healthcare workers (HCW) dealing with cytotoxic drugs are not aware of the harm they are exposed to. Hospitals are following their own norms in view of the lack of credible national guidelines for cytotoxic drug disposal. The recommendations by *Bio medical Waste (Management & Handling) Rules, 1998* to incinerate all the waste generated during administration of cytotoxic drugs (Category 5), is practically not feasible as it consists of huge quantities of plastic waste as well as glass waste and the present day incinerators are probably not suitable for such disposal. We would possibly generate more of Dioxins and Furans instead of reducing risk to human health by such a disposal process.

Key Words: Cytotoxic drugs, Healthcare Facility, Cytotoxic drug disposal.

INTRODUCTION

Cytotoxic drugs work by causing the death of certain cell types and are used to treat conditions such as cancer, rheumatoid arthritis, multiple sclerosis, psoriasis, systemic lupus erythematosus and some ophthalmic conditions. Not all drugs prescribed for cancer are cytotoxic. Cytotoxic drugs are known to be highly toxic to non-target cells, mainly through their action on cell reproduction. Cytotoxic drugs are increasingly being used in a variety of health care and community settings, laboratories and veterinary practices for the treatment of cancer and other medical conditions.

Use of cytotoxic drugs is increasing steadily in the HCF. Not only the oncology departments but other streams of medicine have also started using cytotoxic drugs on routine basis due to increasing incidence of cancer and limited resources available in oncology departments. This is the scenario especially of developing countries. Cytotoxic drugs kill cells very effectively and are mutagenic and therefore need special handling right from administration till their final disposal. There are a series of steps involved in

[@]Kirti Srivastava, Associate Professor, [#]Anuradha Nischal, Associate Professor, [$]Anupam Wakhlu, Assistant Professor, Department of Rheumatology, King George's Medical University, Lucknow
[§]Anshita Singh, PhD Scholar (Batch 2011), King George's Medical University, Lucknow

the handling and use of chemotherapy drugs; purchase contract with the vendor, inventory management, storage, preparation, transfer, administration and waste disposal. Interventions are required at all the steps so as to minimize waste which shall finally require special disposal. The irony is that most doctors and HCW don't recognize this issue as a major problem.

HAZARDS

Health effects in those who prepare and administer cytotoxic drugs include alterations to normal blood cell count, foetal loss and possible malformations in offspring, fertility changes, abdominal pain, hair loss, nasal sores, vomiting, liver damage, contact dermatitis, a local toxic reaction or an allergic reaction that may result from direct contact with the skin or mucous membranes. Little is known about the long-term effects from occupational exposure to cytotoxic drugs. There are no exposure limits set for cytotoxic drugs. Medical opinion suggests that even low-level exposure to cytotoxic drugs should be avoided. Second malignancies are well known in those who have received cancer chemotherapy. Some have also been shown to be mutagenic (causing changes to DNA) or teratogenic (causing birth defects) in various experimental systems. Cytotoxic drugs are very effective in cell killing and have mutagenic effect even in traces. A study from South India highlighted the manifold increase in genetic damage among nurses of oncology department.[1] Approximately 32% of health care workers are exposed to cytotoxic drugs directly or indirectly, of which 8% are exposed through the direct involvement and 24% are exposed indirectly. These facts corroborate the harmful effects of cytotoxic drugs and thereby emphasizing the gravity of the situation.

OCCUPATIONAL EXPOSURE

Occupational exposure to cytotoxic drugs and related waste may occur where control measures fail or are not in place. Exposure may occur through skin contact, skin absorption, inhalation of aerosols and drug particles, ingestion and sharps injuries. Exposure may occur while: preparing drugs, administering drugs, transporting drugs, handling patient waste, transporting and disposing of waste, cleaning spills.[2] Those most likely to be involved in these activities include: nurses and medical officers, pharmacists, laboratory staff, cleaning, maintenance and waste disposal staff, caretakers, veterinary staff, ambulance officers and drivers.[3]

TYPES OF CYTOTOXIC WASTE

In current practice, we come across two types of cytotoxic waste which need special disposal: items having minimal amounts / traces of cytotoxic drugs such as empty vials of cytotoxic drugs, tubing, IV bags, syringes used for infusion, gloves, aprons used by the staff nurses and large quantity of cytotoxic waste such as spills, drug prepared for infusion but not utilised due to some reason (either patient expires before administration or he develops some allergy to the infusion), in these situations we are left with a good

quantity of cytotoxic waste which needs proper disposal. Large quantity of cytotoxic drug waste though rare is now frequently being encountered in heavily loaded oncology wards.

PRESENT MODE OF DISPOSAL

All HCFs are following their own norms in view of the lack of credible national guidelines for cytotoxic drug disposal. Some HCFs are following ISO and NABH standards for high risk medicines and have installed chemo preparation hood in chemo preparation room from where the drug is transported to various wards for administration. Some sort of surveillance in form of blood tests, urine tests, maintaining records for number of abortions, birth abnormalities in the staff members etc, has recently been started in these hospitals. Rotation of staff is regularly done to minimize exposure. However, no measures are being taken for appropriate disposal of the excreta from patients exposed to cytotoxic drugs. Some hospitals have adopted a policy not to send the cytotoxic waste for incineration. These HCFs neutralize the waste with hypochlorite solution and recycle the waste. The HCFs are adopting this policy because the incinerators installed at various central treatment facilities are not capable of generating as high temperatures as needed for incineration of plastic material so as to minimize emission of Dioxins and Furans. Apart from this, many chemotherapy drugs are administered in glass bottles instead of plastic bottles, incinerating these bottles is another problem. Besides, incineration of cytotoxic drugs damages the lining of the incinerator.

CURRENT SCENARIO IN INDIA: / EXISTING NATIONAL REGULATIONS

Bio medical Waste (Management & Handling) Rules, 1998 categorises cytotoxic drugs (Category 5) as waste class, when it is finally discarded /waste & suggests for incineration and landfilling[4]; however it needs special attention, as it is a chemical by itself & is fatal in nature; and is proven carcinogen, mutagen and teratogen.

Hazardous Material (Management, Handling and Transboundary Movement) Rules 2007 in its classification of Class E hazardous waste specifies that any hazardous material with the following characteristics of corrosive with living tissue, toxic, mutagenic & carcinogenic, irrespective of their concentration limit & which possess few typical characteristics, like cytotoxic drugs also have, are hazardous in nature. However, the Hazardous Material Rules, 2007 does not specify any action to be followed by any particular hospital during handling of cytotoxic drugs.

Indian Council of Medical Research – though they are operating one institute for Cytology & Preventive Oncology, but currently are not involved in any such issues, associated with Cytotoxic drugs, Occupational Health & safety for those, who are directly/indirectly dealing with Cytotoxic drugs;

INTERNATIONAL GUIDELINES

The WHO Guide (Safe Management of Wastes from Health Care Activities) provides some reference for these agents, as well as pollution prevention protocols.[5] Countries like US, New Zealand and Australia have their own guidelines in this regard.[6]

Most often referred to guidelines in the United States are the **OSHA** Technical manual: Controlling Occupational Exposure to Hazardous Drugs revised in 1995 and the **NIOSH** Alert: Preventing Occupational Exposure to Antineoplastic and Other Hazardous Drugs, published in 2004.[7]

Others include handling guidelines by the American Society of Hospital-System Pharmacists, the Oncology Nursing Society and the International Society of Oncology Pharmacy Practitioner.

SUGGESTIONS

In view of the absence of national guidelines following recommendations are being suggested to minimize the hazard related to cytotoxic drugs.

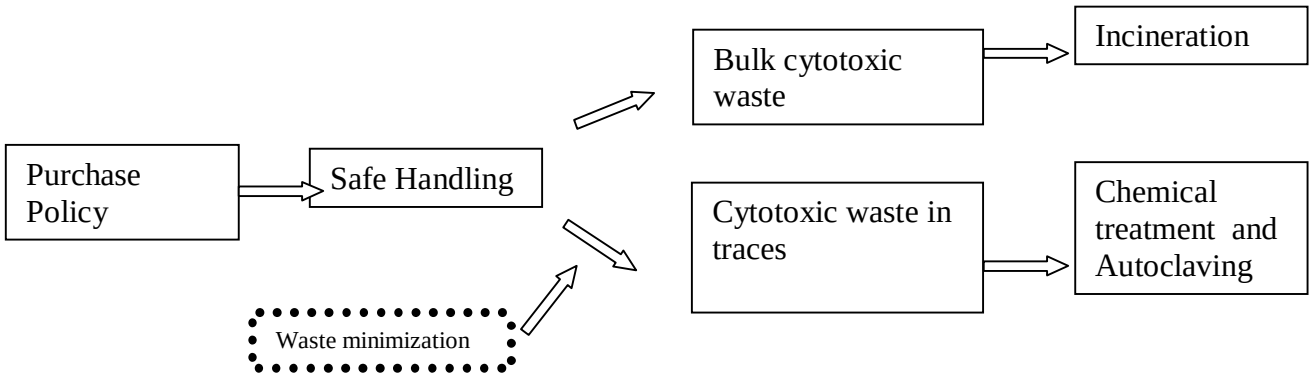

Figure 1: Levels of interventions for safe handling and proper disposal of cytotoxic drugs

1. **Training:** All HCWs dealing with cytotoxic drugs need special training before the person is allowed to work with cytotoxic medications.

2. **Purchase policy:** Special purchase contract should be made with the vendors.

3. **Storage:** Strict inventory management established so that all the cytotoxic drug is utilized before expiry. The labelling should emphasize that the drugs are very expensive and disposal of expired drug is difficult.

4. **Monitoring and Surveillance:** Surveillance system such as blood tests, urine, yearly X-rays should be in place to monitor occupational exposure for the staff posted in wards dealing with cytotoxic drugs. Blood testing can be done once in three months,

X-rays can be done once in a year. Hospital should have careful planning on exposure control, handling of such waste. Rotation of staff is a practice which limits the exposure to the toxic environment.

5. **Preparation:** Drug should be prepared in a specially equipped room having facilities such as chemotherapy hood, exhaust etc. Person preparing the drug should be using double hand gloves, mask, apron etc. Rooms allotted for preparation of drugs are small and inconvenient. Thus the guideline needs to highlight on the minimum space requirement in addition to basic minimum infrastructure required.

6. **Drug Spillage kits** should be made available at all concerned locations.

7. **Transfer:** From the preparation room the drug should be transferred safely to the bed side for administration. For safe Transport, Dum Waiters can be used from pharmacy store to shop.

8. The companies providing medical insurance need to understand that disposal of cytotoxic drugs is an important issue and they need to reconsider the policy of reimbursement, only when the party produces the empty vial which could be containing the leftover drug and its disposal could be an area of concern.
9. **Disposal:** In the absence of any regulatory guidelines on this issue, the hospitals have to make their own arrangements to dispose of cytotoxic waste. Hospitals could have a well specified contract with the vendor to collect all the waste generated while administering cytotoxic drugs to the patients and dispose it off properly as per the norms./ Cytotoxic waste could be handed over to the Central treatment facility (CTF) after labelling it properly and as per norms. Intravenous pouches should not be sent for incineration, because these are made of PVC (which is responsible for the generation of dioxins and furans). Cytotoxic drugs can be neutralised with 5 % Sodium hypochlorite and the glass/ PVC containers sent for recycling. Even the outdated drugs can be neutralized with hypochlorite and drained, and the container sent for recycling. Implementation of a take back policy of unused/ expired drugs by the manufacturer is the best option. Special attention is given to the cytotoxic waste generated in the form of urine/ vomit by patients administered with the drugs.

Full destruction of all cytotoxic substances may require temperature upto 1200°C. Incineration at lower temperatures may result in the release of hazardous cytotoxic vapours into the atmosphere.

Chemical degradation methods which convert cytotoxic compounds into non-toxic/non-genotoxic compounds, can be used not only for drug residues but also for cleaning of contaminated urinals, spillages, and protective clothing. The methods are appropriate for developing countries. Most of these methods are relatively simple and safe; they include oxidation by potassium permanganate ($KMnO_4$) or sulfuric acid ($H2SO_4$), denitrozation by hydrobromic acid (HBr), or reduction by nickel and aluminium.

It should be noted that neither incineration nor chemical degradation currently provides a completely satisfactory solution for the treatment of waste, spillages, or biological fluids contaminated by cytotoxic agents. Until such a solution is available, hospitals should use utmost care while handling cytotoxic drugs.

Central Drugs Standard Control Organization (CDSCO) – As they are supposed to provide technical guidance to Ministry of Health and Family Welfare (MoHFW) & monitor adverse drug reactions, they must come up with a separate guideline for handling, management & disposal of Cytotoxic drugs; since they are supposed to regulate clinical research in India, more research on this issue of cytotoxic drugs & impact from its exposure is necessary. It is very important that CDSCO must come up with a proper measure for handling these drugs at hospital/customer level**.**

RECOMMENDATIONS

A National guideline should be issued by the Ministry of Health and Family Welfare which should detail out the method of preparation, administration, transportation and spill management of CDs. Specifications should be issued for dimensions of the room for preparation of drug, exposure time; number of mixings to be done by a person /day etc. Standards need to be set for the Bio-safety cabinets and gloves/gowns/and all other protective equipments used during preparations, administration, transfer of the drugs.

It should be ensured that personal protective equipment is: properly selected for the individual and task, readily available, clean and functional, correctly used when needed, maintained by appropriately trained staff in keeping with relevant standards. Employers must ensure that all employees know how to fit and use personal protective equipment. Obtain information from the supplier of the cytotoxic drugs, suppliers of the personal protective equipment and published technical standards.

Leftover drugs should not be allowed to be carried back by the patient and his relatives under any circumstances whatsoever. Strict instructions should be issued to the insurance companies and hospitals not to allow the drug vials in the hands of any patient attendant. Pharmacy staff and nursing healthcare should be well trained and aware of the harmful effects due to the mishandling of cytotoxic drugs. The Indian Nursing and Pharma Council should think of starting short specialized courses on Onco-Nursing and Onco-Pharmacy respectively. Computerized prescriptions should be made mandatory, in order to avoid transcription error.

Doctors should be more sensitive of the issue and should not shrug off their duty to biomedical waste team as cytotoxic drugs are toxic waste and not just any other waste. Expired drugs should be taken back by the manufacturers and should be disposed of properly. Multi-specialty hospital also use cytotoxic drugs (like for arthritis etc.), hence they must come under surveillance. The following authorities should be consulted in framing the guidelines: Ministry of Health, Ministry of Environment and Forest, Central Drugs Standards Control Organization (CDSCO), Ministry of Labor: Occupational safety issues should be addressed by the ministry. Indian Council of Medical Research (ICMR)

can be consulted about regulations for usage of drugs. National Cancer Drug Institute, Central Pollution Control Board (CPCB): It can be consulted for the regulations for handling and disposal of cytotoxic waste (onsite segregation).

CONCLUSION

India urgently needs a National guideline which is composite and comprehensive and which should be made mandatory to be followed by all HCFs. All the three stages: preparation, administration and safe disposal should be given equal importance. Screening tests of the staff continually exposed should be devised. Surveillance mechanism needs to be strengthened: indicative parameters to be identified for carrying out surveillance and monitoring on a regular basis. More ways are to be devised for safe disposal of cytotoxic waste besides incineration. Liquid cytotoxic waste in the form of urine/ vomit from patients needs special attention as there are no existing methods to deal with it. Comprehensive effort by the national regulatory authorities, hospitals to formulate guidelines to deal with chemotherapeutic waste is the need of the hour.

Spill Kit: The admixture room should have a ready spill kit with the following items-

1. Phosphate Buffer pH 7.4
2. DMSO 100 per cent
3. Hypochlorite Ointment FNA 0.25 per cent (Formerly Euosol)
4. Sodium Thiosulphate 10 per cent
5. Sodium Carbonate Solution three per cent
6. Sodium Hypochlorite five per cent
7. 1N Hydrochloric Acid
8. Alcohol 70 per cent
9. Powder Free Gloves - two pairs
10. Aerosols Free Mask – one
11. Absorbent Towel -2, 12"x12"
12. Scoop & Brush - one set
13. Eye Glass – one
14. Cytotoxic Disposal Poly Bag -1
15. Gown Poly Coated -one
16. Shoe Covers -one pair
17. Head Cap – one

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SHORT RESEARCH COMMUNICATIONS

AWARENESS ABOUT HOSPITAL WASTE MANAGEMENT AMONG THE TEACHING STAFF OF DENTAL COLLEGES IN BANGALORE CITY

Dr. Sushma Rudraswamy, MDS[@], Dr. Naganandini Sampath, MDS[#], Dr. Nagabhushana Doggalli, MDS[$]

ABSTRACT

Introduction: Improper management of biomedical waste emanating from the healthcare establishments have given rise to many environmental and health problems. Although awareness in this issue has considerably increased over the last few years, sensitivity to this problem has been limited.

Objectives: The present study was conducted to assess the awareness about hospital waste management among the teaching staff of Dental Colleges in Bangalore city.

Methodology: A specially prepared and pre-tested structured questionnaire was given to assess the awareness among the teaching staff of Dental Colleges. In each institution the following elements were studied using checklist i.e. segregation, colour coding, disinfection, containment, personal protective equipment, reporting of injuries, display of standard operating protocols, in house transport and disposal.

Results: Study participants comprised of 259 Dentists (126 male and 133 female dentists) from eight Dental Colleges in Bangalore city with mean age of 33.48±6.76. Regarding the participants' knowledge on personal protective equipment's 91.1% answered correctly that personal protective equipment's prevents the transmission of infection from patient to dental health care personnel and from dental health care personnel to patient. A total of 78% knew that there could be risk posed to the workers by exposure of blood-borne viruses like Hepatitis-B (HBV), Hepatitis-C (HCV) Human immunodeficiency virus (HIV) with needle stick injury.

Conclusion: Awareness about hospital waste management showed dentist and dental auxiliaries had good knowledge of waste management as compared to attenders. However, when authenticities of these responses were checked by the investigator only staff of two hospitals practiced it. This is due to the fact that the responsibilities of waste management are given to the attenders and rest of the staff thinks that it is the job of the attenders not theirs. Also they think that whatever segregation is happening is an extra effort they are putting in, apart from their regular duties in some hospitals.

Key words: Hospital waste management, awareness, biomedical waste, dental hospital waste.

[@]Lecturer, Department of Public Health Dentistry, J.S.S Dental College and Hospital, J.S.S University, Mysore, India

[#]Professor and Head of Department, Department of Public Health Dentistry, The Oxford Dental College, Hospital and Research Centre, Bangalore, India.

[$] Reader, Department of Oral Medicine and Radiology, J.S.S Dental College and Hospital, J.S.S University, Mysore, India

INTRODUCTION

Health and disease have no political or geographical boundaries. With the advances in scientific knowledge, the waste from hospitals increased and the implications of hospital wastes are manifold.[1]

Until fairly recently, hospital waste management was not generally considered an issue. In 1980s and 1990s concerns about exposure to human immunodeficiency virus and hepatitis B virus led to questions about potential risks inherent in hospital waste.[2,3] Thus hospital waste generation has become a prime concern due to its multidimensional ramifications as a risk factor to the health of patients, hospital staff and extending beyond the boundaries of the hospital establishment to the general populations.

Hospital waste management has been brought into focus in India recently, particularly with the notification of the biomedical waste 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.[4] These rules have been formed in exercise of the powers conferred by sections 6, 8 and 25 of environmental protection act 1986. The rule makes it mandatory for the health care establishment to segregate, disinfect and dispose their waste in eco friendly manner. Clearly, statutory safeguards for biomedical waste management practice in Indian hospitals have still not achieved the desired standards.

Now hospital waste management is one of the thrust areas which are drawing the attention of health authorities and the Government. There is a lot of confusion and problems among the generators, operators, decision-makers and the general community about the safe management.

In spite of the fact that the biomedical waste is a great health hazard, the awareness regarding biomedical waste handling and disposal is abysmally low and scientific literature search [5-10] show significant gap in the knowledge and practice among the staff (dentists, auxillary) about hospital waste management.

MATERIALS AND METHODS

The ethical clearance was obtained from the ethical committee of The Oxford Dental College, Hospital and Research Centre prior to the start of the study. All the required and relevant information regarding dental colleges that were approved/ recognized by DCI was obtained from the website of the Dental Council of India.

Fifty percent of the total sixteen Dental Colleges that is eight was selected using random selection considering the constraints of limited resources of manpower, finance, and administrative logistics. Teaching Staff of Dental Colleges not willing to participate and Office staff, drivers, staffs directly or indirectly not involved in hospital waste generation were excluded.

A pilot study was performed on the study population prior to the start of the study in one of the dental colleges in the month of November 2008. Expert opinion regarding the questionnaire was sought. The pilot study served as a preliminary study to identify any organizational problems, and to check the validity of questionnaire. Cronbachs alpha value of 0.82 showed good internal consistency of the questionnaire. Results from this pilot study highlighted the need for minor revisions in the questionnaire.

This pre-tested structured questionnaire was given to assess the awareness among the teaching staff. The questionnaire was in English consisting of 10 questions. Questionnaire took less than 10 min to answer. All the answers were kept confidential and were not depicted against their identity.

RESULTS

Study participants comprised of 259 Dentists (126 male and 133 female dentists) from eight Dental Colleges in Bangalore city with mean age of 33.48±6.76 (Table 1).

With regards to the segregation of waste into different categories, 57.1% of them answered correctly that it should be done at the point of generation. 82.2% answered correctly that the purpose of "disinfection before disposal" reduce the risk of transmission of infection, strengthen and support the overall standards of hospital hygiene and also prevents the spread of multidrug- resistant and other nosocomial pathogen.

A total of 67.6% of dentist identified the biohazard symbol correctly. With respect to the technique which is not acceptable for the handling of sharp needles, 82.6% answered correctly that disposing needle in general trash bag was not acceptable (Table 2).

Regarding the participants' knowledge on personal protective equipments 91.1% answered correctly that personal protective equipments prevents the transmission of infection from patient to dental health care personnel and from dental health care personnel to patient.

A total of 78% knew that there could be risk posed to the workers by exposure of blood-borne viruses like Hepatitis-B (HBV), Hepatitis-C (HCV) Human immunodeficiency virus (HIV) with needle stick injury. When asked to identify the colour code for Infectious waste, yellow color was correctly identified by 67.1% of dentists. 94.6 % of the dentists said that Hepatitis-B immunization for health care workers was compulsory and 93.8% responded correctly that post exposure prophylaxis should be initiated as soon as possible after possible HIV exposure in health care worker. 89.6 % knew that mercury and excess amalgam should be stored in water/ fixer solution.

Table 1: Age and Gender Distribution among Dentists

Dentist Age group	Male		Female		Total	
	No	%	No	%	No	%
20-29	32	25.4	47	35.3	79	30.5
30-39	72	57.1	70	52.6	142	54.8
40-49	13	10.3	14	10.5	27	10.4
50-59	9	7.1	2	1.5	11	4.2
Total	126	100.0	133	100.0	259	100.0
Mean ± SD	34.25±7.21		32.75±6.25		33.48±6.76	

Table 2: Assessment of knowledge regarding hospital waste management among dentists

Knowledge Questions	Total dentist N=259	
	No	%
1. Segregation of waste into different categories should be done at the point of generation	148	57.1
2. Disinfection before disposal helps to reduce the risk of transmission of infection, Strengthen and support the overall standards of hospital hygiene, Prevents the spread of multidrug- resistant and other nosocomial pathogen	213	82.2
3. Identification of the biohazard symbol	175	67.6
4 : Disposing of a needle in general trash bag is not an acceptable technique for the handling of sharp needles	214	82.6
5. The presence of personal protective equipments Prevents the transmission of infection from patient to dental health care personnel and Prevents the transmission of infection from dental health care personnel to patient	236	91.1
6. The main risk posed by needle stick injury is exposure of the workers to blood- borne viruses like Hepatitis-B (HBV) ,Hepatitis-C (HCV) , Human immunodeficiency virus (HIV)	202	78.0
7. Infectious waste is given the colour code of yellow	179	69.1
8. Hepatitis-B immunization for health care workers is compulsory	245	94.6
9. After possible HIV exposure in health care worker post exposure prophylaxis to be initiated as soon as possible	243	93.8
10. Mercury and excess amalgam should be stored in water/ fixer solution	232	89.6

DISCUSSION

Hospitals and other health-care establishments have a "duty of care" for the environment and for public health, and have particular responsibilities in relation to the waste they produce. It is ironical that the very hospital that brings relief to the sick can create health hazard for hospital staff, patients as well as the community at large. Safe management of health care waste becomes very important when it comes to environment conservation and health of the community. The onus is on such establishments to ensure that there are no adverse health and environmental consequences of their waste handling, treatment, and disposal activities.

Literature search show poor knowledge, attitude and practices of biomedical waste management among staff and have reported that there is urgent need to train and educate all the staff, in order to adopt an effective waste management practice.[5-10] A chain is as strong as the weakest link in it, thus the entire staff involved in waste management at some point or the other should be trained properly.

Before providing the training programme, it is mandatory to understand the existing gaps and deficiencies in the study participants' knowledge, perceptions, behavior towards hospital waste management. Knowledge, attitude and practices of the personnel play an important role because the lack of these even with good infrastructure and technology is of little or no use in proper waste management. Knowing this, the training programme can be aimed to make participants understand- environment friendly, healthy and economically viable in-house management systems, to ensure that the waste is carried responsibly from cradle to grave.

In the present study, 75.7% of dentists were aware of risk posed by needle stick injury. Where as in a study conducted by Kishore et al it was observed not all dentists were aware of the risks they were exposed to.[10] The present study 65% of the dentists reported rightly that the yellow bag should be used for infected waste. Kishore et al have reported 28% of the dentists have identified yellow bag should be used for infected waste.[10]

In the present study 98.6% of dentists were using apron, mask and gloves as personal protection devices for infection control. This finding was more when compared to study done by Treasure et al[11] (94.5% gloves, 83.4 % masks) and Kishore et al[10] (67% gloves). The reason for this was stated as insufficient supply of gloves in the hospital in the study done by Kishore et al.[10]

Health-care waste management is strongly influenced by cultural, social, and economic circumstances. Experts working in this field opine that waste management committee should be formed which would be helpful in overseeing the day to day activities concerning waste management. The head of the hospital should form a waste management team to develop a waste management plan and should formally appoint the members of the waste management team in writing, informing each of them of their duties and responsibilities. The waste management team should review annually and

initiate changes necessary to upgrade the waste management system. Interim revisions may also be made as and when necessary.

Hence, a well designed hospital waste policy, a legislative framework, and plans for achieving local implementation are essential.

Optimal waste management is at best, a moving target. Usually attenders are responsible for spearheading the waste management initiatives. Waste-handling is left to lower-level workers who operate without any training, guidance, and supervision. Managing waste requires the effective management of the people who produce the waste, not just those who handle it. It's primarily the dentists who are responsible for waste generation. But currently, as most of us are aware it is mainly the resistant attitude of dentists that is responsible for poor results on this front. Dentist at the high end of hierarchy should take this issue which needs to be addressed not as a burden difficult to bear. Proper management of dental hospital waste should be addressed with dignity, by concerted action as duty, and by no uncertain terms as responding to pressure. They probably should not do it because there is legislation, but they need to do it as they are socially accountable.

An improvement in hospital waste management involves a number of activities, which can be undertaken as series of small steps on the road to improvement. There is no 'one stop' technical solution.[12] Spending money on impressive machinery does not guarantee an improvement. Improvement results from training, provision of storage equipment, effective supervision and commitment by management, rather than from technology alone.

Additionally, when properly implemented and enforced, effective waste management can have distinct economic benefits, such as cost saving linked to waste reduction and improved purchasing practices. Such a programme, when supported by committed healthcare management, will contribute to the improvement of patients care, promote health and safety of staff, and help improve the overall economy and operation of the facility. It will also enhance the image of health services with regard to the quality of patient care and protection of the environment.

CONCLUSION

Awareness about hospital waste management showed dentist and dental auxiliaries had good knowledge of waste management as compared to attenders. However, when authenticities of these responses were checked by the investigator only staff of two hospitals practiced it. This is due to the fact that the responsibilities of waste management are given to the attenders and rest of the staff thinks that it is the job of the attenders not theirs. Also they think that whatever segregation is happening is an extra effort they are putting in, apart from their regular duties in some hospitals.

The most vital component of the waste management plans that have been formulated is to bring about a transformation in the mind sets and develop a system and culture through

education, training and persistent motivation of the health care staff. Developing a highly motivated workforce by training in safe practices, monitoring those of practices, with continued improvements would work towards a ***"safe protected biohazard free environment".***

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CONCERN

FEW CONCERNS ABOUT WASTE SHARPS MANAGEMENT AND PROBABLE SOLUTION

A. Issues with Waste Sharp Destroyers (Needle Burners).

Prepared by Dr. B. Ramakrishna Goud, MD (Com Medicine)[#]

1. The equipment is prone for wear and tear (in most places they were rusted and some places they were rusted).
2. The two stage system destructors that is firstly, the slot for burning followed by a slot for cutting (or "culling" the hub of syringe) are prone for malfunction.
3. The cutting slot gets worn off and become very blunt making culling (cutting) difficult by the staff.
4. Most often these equipment are not "fixed" to the platform and therefore while trying to “cull” the hub of the syringe they tend to “move” back and forth (basically not stable)
5. While the needle gets burnt, it generates sparks and also black fumes which not only are irritants but may also be very toxic.
6. This efforts leads to multiplication of waste sharps, that is we end up with a tiny waste sharp with a burn end attached to hub and a small piece of distal end of the needle that gets collected in a tray after it falls from the slot. Now the staff has to handle waste sharps not only of the syringe but also the burnt ends in tray.
7. The system is dependent on electric supply…..in times of power cuts the whole injection management system fails.
8. We need a waste sharp destructor at every point of generation and hope the systems are working uniformly in all the points of generation so as to say that the institution has a functioning waste sharp management system.
9. The waste sharp destructors are expensive.

Given the above practical problems we have to devise an alternative effective and efficient waste sharps management system, I would like to share with you our efforts towards developing a “system” which full fills the objective of avoiding reuse and infections as well as follows the principles of waste management.

[#]Department of Community Health, St. Johns Medical College, Sarjapur Road, Bengaluru-34

B. Method for safe management of waste sharps

Types of waste sharps:

a. Metal waste sharps: Injection needles, Suturing needles, scalpel blades, razor blades, any other metal waste sharp like aluminium covering of vials and needle embedded syringes like low molecular weight heparin and auto-disable syringes like the ones used in immunization programme.

b. Glass waste sharps: broken ampoules and damaged vials. Intact glassware like multidose injection vials should be considered for separate segregation and containment and to be given to an authorized glass waste recycler.

Hazards of waste sharps:

1. Cause visible injury. For e.g. prick or cut

2. Contaminated sharps may transmit infections like Hepatitis B, Hepatitis C, HIV

Objectives of waste sharp management:

1. To contain waste sharps at every point of generation itself by the person generating waste.
2. To eliminating the possibility of accidental waste sharp injuries while handling of waste.
3. To disinfect the waste sharps at point of containment itself.
4. To disfigure waste sharps (especially needles) by containing them in concentrated bleach solution (disfigurement by corrosion of steel surface because of action of Hypochlorous acid ions).

How to achieve the above stated objectives

1. Segregate all waste sharps at point of generation by the person generating the waste (for example after giving an injection a nurse or doctor or after drawing blood sample a laboratory technician should not recap needle and deposit this uncapped needle in a puncture proof plastic container like a Jerry Can.

2. Jerry can is an ideal waste sharp container because it has a handle to carry the can safely, a narrow mouth to deposit the waste sharp and also preventing retrieval of waste sharp, to fill and empty disinfectant solution and a broad base to achieve stability.

3. The screw cap which could be secured to the can itself by a file tag or any other available thick thread. After the can is ¾ th full can be closed with cap and if need be sealed.

4. Preparation of Concentrated bleach solution:

a. A good quality commercially available bleaching powder (contains 33% available chlorine).

b. Take 30 grams of bleaching powder and mix it in 1 litre of water.
c. Empty all of the contents (including the residual calcium carbonate/lime this will stain the waste sharps enhancing the disfiguring potential of the bleach solution) into the jerry can meant for waste sharp containment.

d. The bleach solution could be changed once a week if possible or at least once in two weeks. This frequency will achieve the purpose of disinfection and disfigurement more efficiently.

e. To change the bleach solution, tie the mouth of the can with a mesh or cloth piece and tilt the can into sink. Once the can is emptied of the old bleach solution the fresh bleach solution could be poured into can. Tying the mouth prevents escape of sharps from can.

f. Please note 30 grams of bleaching powder is the minimum quantity, if need be even 100 grams of bleaching powder could be used for preparing concentrated bleach solution. The Jerry can should be colour coded as per Bio Medical Waste (management and handling) Rules. It should be labelled and a Biohazard symbol pasted.

How to dispose the waste sharps:

Once a jerry can is $3/4^{th}$ full, the can should be closed with screw cap. The can should be weighed and the same recorded in register maintained for quantifying waste. The jerry can should be handed over to the common bio medical waste treatment facility (CBMWTF) or if there is no linking with CBMWTF then the jerry can should be stored in a secured storage room within the hospital. No attempts should be made to open or cut open the jerry can and bury or dump into deep burial pit.

LEAD SHIELD FROM LEAD FOIL WASTE -BEST OUT OF WASTE

Dr. S. Padmashree BDS, MDS[@], Dr. K. Pushpanjali BDS, MDS[#]

ABSTRACT

Dental Radiology offices generate lead wastes, such as foils from Intraoral Radiographic Dental Film, shields etc. Lead foils are used in the wrapping that shields X-ray film and lead shields are used during patient x-rays for radiation protection. An environmental issue exists because these foils are typically thrown out with general waste, as recycling programmes have not been identified nor popularized. Therefore an initiative was made towards constructing a lead shield from the waste lead foils which is being used effectively in our institution.

INTRODUCTION

Dental Radiology offices generate lead wastes, such as foils from Intraoral Radiographic dental Film, lead aprons etc. Lead foils are used in the wrapping that shields X-ray film and lead shields are used during patient x-rays for radiation protection. Intraoral films are packaged with a sheet of lead foil to protect the film from backscatter and secondary irradiation[1], and prevents loss of image detail caused by back scatter radiation, principally from tissues behind the film.[2] Lead foils, shields are considered as hazardous waste unless they are recycled for scrap metal content .If the waste is recycled, It must go to a certified recycling facility and records or receipts such handing over must be kept. Hazardous waste cannot be disposed as municipal solid waste (trash).[3] Instead, we can prepare a lead shield using the waste lead foils, which we get after exposure of the intraoral radiographic dental films.

MATERIALS AND METHODS

Vaidehi Dental College situated in Bangalore has an outpatient of 200 per day and an average of 60 patients comes for IOPA x ray. Therefore huge quantity of lead waste would get collected and to prevent it from entering the other waste stream, system for segregation was initiated. From the period of 2005- 2007 lead foils were collected which accounted to approx 13550 lead foils. Four types and sizes of Intraoral dental film commonly used in our department are: Kodak Insight, size 0; Kodak Insight 1; Kodak Ektaspeed size 2; and Kodak occlusal films. After exposing the intraoral x-ray film, during processing the x-ray film in the dark room, the contents of the film packet –the outer plastic cover, the Black paper and the lead foils were collected separately as shown in figure 1. Resources required were a 6X3 foot ply wooden sheet, fevicol glue, wheels, aluminum step wedge a carpenter and 2 likeminded staff.

[@] Prof & HOD, Dept. of Oral medicine & Radiology, Vydehi Institute of Dental Sciences and Research centre, Bangalore.
[#] PGDHHM, Prof & HOD, Dept. of Public Health Dentistry, M. S. Ramaiah Dental College, Bangalore.

Then 5 layers of lead foils (around 1350 foils) were stuck on both sides of the wooden sheet using fevicol glue, and allowed to dry completely. Then the wooden sheet with lead foils was laminated on either side with a beading .The wheels were fixed so that the lead shield can be made movable (figure 2).

RESULTS

Once the entire lead shield was prepared, an aluminium step wedge was placed in front of the lead shield and the x-ray film was placed exactly behind the wedge. Then we tried to capture the image of the aluminium wedge by exposing the x-ray film (figure 3). After processing, the film was blank without any image (figure 4) indicating that the lead shield was absorbing all the x-rays and fulfilled the safety norms of lead shield .

CONCLUSION

Abundance of literatures has reported the toxic nature of lead. Effects can range from learning disability to seizures and death. The lead content of the foil backing of 4 types of intraoral film commonly used by dentists is 69% to 85%. A full mouth radiographic series would generate 11.2 g of waste lead. Although highly toxic when taken internally in any of its forms, symptoms of lead exposure usually occurs after it has accumulated in the body over a period of time. Hence proper management of lead waste from dental establishments is a must. In view of this, an initiative was being taken towards building a good workable system which can serve as a role model for other health care establishments. This particular measure could be replicated or even modified. Our next endeavor in this area would be to continue to segregate and contain lead foil and to utilise the same to paste on the walls of the room where x rays are exposed. we thought of a innovative way of utilizing the lead foil waste by using the same to construct a lead shield which is very essential for radiation protection in the radiology section. Good waste management systems require voluntary measures, committed team and support and cooperation from management.

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3. Leonard J.S.Tsuji et al. Foil backing used in intraoral radiographic dental film: a source of environmental Lead. J Can Dent Assoc 2005;71(1):35-8

ACKNOWLEDGEMENTS

The authors would like to acknowledge the management of Vaidehi Dental College and all Faculty in the Department of Oral Medicine and Radiology.

LEGENDS FOR THE PHOTOGRAPHS

1. The segregation of waste lead foil, black paper and outer plastic cover of intraoral dental film.
2. The newly prepared lead shield.
3. Exposure of aluminum wedge to X-rays.
4. The blank intraoral dental film after processing.

Fig 1

Fig 2

Fig 3

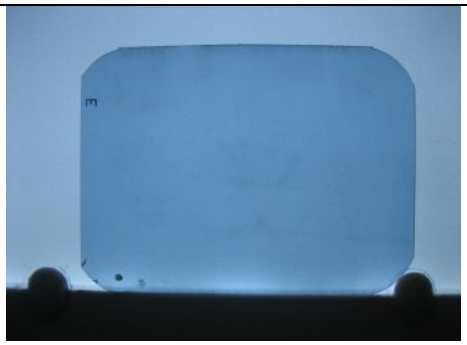


Fig 4

CONCERN

WASTE GENERATED IN LABORATORIES
-tips for management

Prepared by Dr. B. Ramakrishna Goud, MD (Com Medicine)[#]

General

1. Do not allow any of the waste items to dry

2. Contain all waste items immediately in a container with Disinfectant solution.

3. All plastic-ware to be contained in a separate container with Disinfectant solution

4. Segregate and contain waste items that requiring same treatment and/or disposal in a single container.

5. Disfigurement of identified waste items (e.g. plastic syringe) at a common point like common waste treatment facility using a shredder rather than using appliances like scissors, cutting pliers or like.

Sl no	Type of waste	Method of management
1	Injection needle and other metallic sharps	*Separate from hub of syringe and contain in a puncture proof container with concentrated bleach solution*
2	Broken glass ware	Contain separately in a puncture proof container with concentrated bleach solution.
3	Plastic syringe	Blue color coded container with concentrated bleach solution. Mutilation (disfigurement at common waste treatment facility in a shredder). If not linked to a common waste treatment facility then use of hub cutters could be considered.
4	Glass slides/other glass-ware which are likely to be used in laboratory for collection of samples	Segregate and contain in a labeled blue or white color coded container with concentrated bleach solution
5	*Infected waste like cotton, tissue paper*	Contain in a yellow colour coded container
6	Intact vials/other glass bottles	Disinfected by chemical or thermal methods
7	Plastic I.V. Bottles (if generated in a laboratory)	To be contained along with plastic syringes.
8	Body fluids like blood, serum, urine, aspirates or fecal samples.	To be contained in a thick red colour coded plastic container with foot paddle operated lid. This container to be filled to half with concentrated bleach solution or any other standard disinfectant solution. A minimum of 1 hour contact period should be allowed. Then the contents could be drained into the wash sink connected to liquid waste management system.

[#]Department of Community Health, St. Johns Medical College, Sarjapur Road, Bengaluru-34

TREATMENT OPTIONS AT POINT OF GENERATION (POG)

1) Segregation in appropriate colour coded containers.
2) Containment in preferably thick plastic containers with lids (where ever possible *no-touch* type of containers to be used)
3) Disfiguring / Mutilation at POG: Standard needle destructors or hub cutters could b used. However they have limitations in terms of operational efficiency, safety and servicing.
4) Disinfection: Disinfection is a process, which destroys the infectious microorganisms. High-level disinfection destroys all pathogenic organisms and most of other microorganism but spores may survive. Intermediate and low level of disinfection destroys the pathogenic organisms. Decontamination is the same as low level of disinfection, this process gets rid of visible, contamination of surfaces, equipments etc.

Chemical Disinfection

- Use Bleach Solution / Savlon / Hypochlorite / Chlorhxedine / at recommended concentrations.
- Flush with Bleach/Disinfectant solution with needle in place.
- Separate needle from the syringe into the puncture proof container.
- Put the syringe with plunger or the separated plunger and clamber into the container with disinfectant solution.

Thermal Disinfection:

- Either Dry and moist heat to be used for sterilization.
- If autoclaves / microwaves are available syringes and needle to be autoclaved. Autoclaving at 121^0C for 20 mins, at 15 lbs pressure.
- If boiling is used as a method then the items to be boiled for 20-30 minutes.

Management of Spills and accidents

- Wear gloves throughout any procedure.
- Cover spill with absorbent material.
- Pour disinfectant around the spill and over the absorbent materials.
- Leave for 30 min.
- Clean with absorbent material
- Place in waste container labeled as Infectious Waste.
- Wipe the surface again with disinfectant.
- Sweep broken glass etc., with a brush into the waste container.

Response from Environment Management Policy Research Institute (EMPRI)towards capacity building in Karnataka

A process to address hospital waste management

RMN Sahai, IFS[@], Vanashree Vipin Singh, IFS[#], SJ Vikas[§],

BACKGROUND

We are aware of the fact that unscientific disposal of Bio-Medical Waste (BMW) is a health hazard and hence its treatment and disposal should be done in a scientific manner. Unsafe handling and disposal of hospital wastes together with domestic and commercial wastes is a common practice followed in urban and rural areas. This poses a threat not only to human health but also to the environment. Disposal methods including terrestrial dumping, uncontrolled burning and dumping of hospital wastes especially in landfills in unscientific manner is a matter of concern.

In view of the above, the Ministry of Environment and Forest, Government of India in exercise of the powers conferred by Sections 6, 8 and 25 of the Environment (Protection) Act, 1986 has issued the Bio-Medical Waste (Management and Handling) Rules, 1998 which was amended during the year 2000 and 2003.These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle bio-medical waste in any form.

As per the rule every Health Care Establishment (HCE) generating, collecting, receiving, storing, transporting, treating, disposing and/or handling BMW need to obtain an authorisation from the prescribed authority i.e., State Pollution Control Board. It also makes municipal corporations, municipal boards or urban local bodies responsible for providing suitable common disposal/incineration sites for the biomedical wastes generated in the area under their jurisdiction. As per the provisions of Environmental Protection Act, 1986 any institution violating provisions of the Rules shall be punishable with imprisonment for a term which may extend to five years with fine which may extend to one lakh rupees, or with both.

In spite of the fact that the Rule is good 14 years old, implementation and compliance of the Rule remains a challenge. With improvement of medical facilities in the state, more and more biomedical waste was being generated and hence the problem required a greater emphasis and co-ordinated approach among the concerned stakeholders. The matter was highlighted before honourable Lok Adalat of Karnataka, which drew serious attention to the issue. Subsequently, directions were issued to the Government for taking necessary action to achieve desired compliance of the Rules.

[@]Director General, [#]Director, [$]Joint Director, [§]PDO,

Environmental Management and Policy Research Institute (EMPRI)

Accordingly, it was decided to setup a mechanism and institutional framework at the district level so that the system takes care of proper training and implementation of BMW Rules in a sustainable manner. In pursuance of the above, Department of Forest, Ecology and Environment (DFEE), Government of Karnataka (GoK) directed Environmental Management and Policy Research Institute (EMPRI) to take up a training programme in order to sensitize the stakeholders about the seriousness of the matter, inform the legal provisions of BMW (Management and Handling) Rules and training on techniques of collection and disposal of BMW.

INITIATIVE OF EMPRI

Environmental Management and Policy Research Institute (EMPRI) is an autonomous body established by the Government of Karnataka in September 2002, under Department of Forest, Ecology and Environment, having objective of conducting training programmes on environmental issues.

A workshop of stakeholders was organised to finalize the modalities of the training programme by EMPRI. Valuable suggestions were received from M.S. Ramaiah Medical College, St. Johns Medical College, Bangalore Medical College, Karnataka Health System Development & Reform Project (KHSDRP) and Karnataka State Pollution Control Board (KSPCB) to constitute a team comprising representatives from Government, Private and Veterinary sectors. From the private sector, it was suggested to involve a representative from Indian Medical Association (IMA) or General practitioner Association which will facilitate to implement training programmes to clinics and nursing homes. From the Government sector it was felt appropriate to involve District Nodal Officer of KHSDRP as Co-ordinator. They also suggested to include nursing staff who regularly handle BMW. Accordingly, inputs were given to the Government for effective implementation of the training programme. Subsequently, the Government Order. No, FEE.22EPC2009. Bangalore, dated 16.08.2011 was issued. The order constituted a team consisting of six members in each district as trainers' team which consist of:

1. A doctor from Community Medicine/Microbiology Department in the rank of Assistant Professor (or above level) nominated by the Principal of the Medical College in the district
2. A representative from IMA/General practitioner Association of the District
3. Deputy Director/ Joint Director of the Department of Animal Husbandry.
4. Senior Nurse of the District Hospital
5. Senior Nurse/Nursing Superintendent of the private sector hospital nominated by the unit
6. District Nodal Officer of KHSDRP-Coordinator.

This has brought all stakeholders on a common platform which provided opportunity to share the information and resolve the issues.

The team members were identified by District Health Officer (DHO) in consultation with Regional Officer (RO), KSPCB in all the districts. They were trained in Bangalore in Training of Trainers (ToT) programme organised by EMPRI. On return, district level training programmes to medical and para medical staff were conducted by the team members in 15 districts and is being organised in the rest of the districts of the state. For this purpose, DFEE, GoK has released funds to EMPRI.

TRAINING OF TRAINERS

EMPRI initiated action in August, 2011 towards organising Training of Trainers (ToT) programme for Trainers team in association with KSPCB, KHSDRP, Department of Health and Family Welfare, Department of Animal Husbandry & Veterinary Services (DAH&VS) and Department of Medical Education. The programme was conducted in Bangalore and the master resource persons were identified in co-ordination with M. S. Ramaiah Medical College, St. John's Hospital and Bangalore Medical College. In this regard, EMPRI has partnered with M. S. Ramaiah Medical College and obtained technical knowledge, skill and expertise on BMW Management. During the entire ToT programme, the Department of Community Medicine, M. S. Ramaiah Medical College has extended their co-operation whole heartedly by providing Master Resource personnel. The ToT programme was conducted in phased manner and the details are as given below.

Table 1: Districts participated in ToT

ToT	Districts Covered	No. of Participants
1st ToT , 5th-7th September, 2011	Tumkur, Mysore, Mandya, Kolar, Chikkaballapur, Bangalore Urban, Bangalore Rural	44
2nd ToT, 15th-17th September, 2011	Chikkamagalur, Chamarajanagar, Dakshina Kannada, Hassan, Kodagu, Udupi	32
3rd ToT, 7th – 9th August, 2012	Ramnagaram, Chitradurga, Davanagere, Dharwad, Shimoga	29
4th ToT, 22nd – 24th August, 2012	Belgaum, Bijapur, Bagalkot, Haveri, Uttara Kannada, Gadag	31
5th ToT, 29th -31st August, 2012	Bellary, Bidar, Gulbarga, Koppal, Raichur, Yadgir	45
Total	**24 districts**	**136**

The ToT was designed to be three day residential programme and the schedule of activities is detailed in Table 2.

Table 2: Schedule of activities of ToT

Days	Activities
Day 1	• Inauguration-Why do we need training on Health Care Waste Management? • District wise situation analysis presentation by the participants of each districts • BMW Rules and implementation • System approach on segregation, storage, transportation and disposal • Disinfection and management of sharps • Bio Medical Waste Management in veterinary hospitals • Learning and capacity building in Health Care Waste Management • Panel discussion on BMW Management • Macro areas on Medical Waste Management • Briefing regarding field visits & preparation of action plan
Day 2	• Field visit to common Bio Medical Waste Management plant, Dobbaspet • Documentary on Bio Medical Waste Management • Visit to hospital (MSRMC) • Open session and tips for action plan development
Day 3	• Liquid waste management • Issues on mercury and dental waste management • Technology options for Medical Waste Management • Comments on Frequently Asked Questions (FAQ) and training methodology at district level • District wise action plan preparation and presentation by team • Valedictory and oath taking by the team

Master trainers were requested to collect details of Government, Private hospitals, Veterinary Institution, Animal House, Pathology Laboratory, Blood bank and any other HCE and make a short presentation on "District Wise Situation Analysis on Bio-medical Waste Management" on first day of the training programme. This was quite an enriching experience which provided a better insight on the existing situation of BMW Management.

The BMW (Management and Handling) Rules, 1998 was considered to be most important and was dealt by KSPCB personnel. The confusion on colour coding and type of containers and plastic bags with waste category was resolved by demonstration and by conducting activities.

The session on segregation emphasised the importance of "segregation at source" for successful management of BMW. The resource persons could effectively convey that segregation of waste at source is the most important step in management of BMW. Once BMW mixes with any other waste, the problem magnifies and becomes unmanageable. The fact that 85% of hospital waste is general waste and only 15% of waste is infectious was understood by the participants through visits to the model hospital on second day of the training programme. It is critical that waste be segregated at the point of generation itself and this message was emphasised to the participants. The participants were taken to

the Common Bio-Medical Waste Treatment Facility (CBMWTF) wherein they were made to interact with the operator of the facility.

During the training programme material was supplied to the trainees along with the training kit, which included updated legislation, BMW Management manual, documentary, short movie, guidelines of KHSDRP and power-point presentation of Master Resource persons in the form of CD as a resource tool for conducting training programme at district level.

On third day Liquid Waste Management, Dental Waste Management and Mercury Spills were dealt with. The district wise action plan were prepared by the participants and presented before the panel comprising of Government officials and Master Resource persons. This has given them confidence to conduct training programme in their district. After every ToT programme, a very high level of motivation was achieved.

The team members after completion of ToT were referred as “Master Trainers”. In addition to implementation of training programme, they were expected to follow up the implementation of BMW rules and monitor the disposal of BMW in the districts and shall carryout periodic inspection of HCEs and shall report to KSPCB, health department, animal husbandry if lapses are observed.

Visit to CBMWTF at Dobbaspet

DISTRICT LEVEL TRAINING PROGRAMME

On return to the district the Master Trainers took up training programmes for Medical and Para medical staffs in their respective district, in phased manner with support of EMPRI. District Level Training Programme (DLTP) was designed as one day training programme for 60 participants from Government, Private, Veterinary, Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), blood bank and pathological laboratories. To cover more HCEs, the programme was conducted for three consecutive days. From each HCE two personnel who are at the decision making level like an administrator or doctors and who handles Bio-medical waste like nurses, helpers and D-groups staffs were asked to attend.

The DLTP started from the month of November, 2011 and covered 16 districts. The details of the District level programmes are furnished below.

Table 3: Details of District level programme

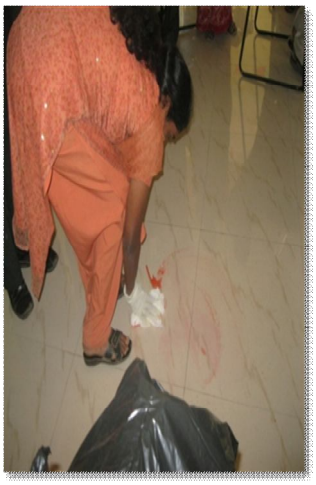
Sl.No	Districts Covered	Duration	No. of participants
1	Mandya	9th to 11th November, 2011	166
2	Mysore	24th to 26th November, 2011	146
3	Chikkaballapur	29th November to 1st December, 2011	178
4	Bangalore Urban	22nd to 24th December, 2011	253
5	Chamarajanagar	4th to 6th January, 2012	146
6	Tumkur	11th to 13th January, 2012	185
7	Chikkamagalur	24th to 26th January, 2012	193
8	Dakshina Kannada	23rd to 25thMay, 2012	179
9	Bangalore Rural	13th to 15th June, 2012	131
10	Kodagu	19th to 21st June, 2012	193
11	Hassan	28th to 30th June, 2012	172
12	Udupi	30th July to 1st August, 2012	186
13	Kolar	25th to 27th Sep,2012	178
14	Ramnagar	6th to 8th Nov, 2012	147
15	Haveri	6th to 8th Nov, 2012	181
16	Bijapur	6th to 8th Nov, 2012	205

Till now, 2839 personnel have been trained from 1506 HCEs of various sectors.

Status of DLTP implementation in Karnataka

During the training programme emphasis was given on compliance of Bio-Medical Waste Management Rules, implementation of segregation at source, proper transportation and tie up with CBMWTF. Activities on management of blood spill and preparation of 1% hypochlorite was conducted. A document on Frequently Asked Questions (FAQ) was developed and updated in every training programme through interaction and discussion and provided to participants. At district level many establishments under veterinary sector were just setting up a system for Bio-Medical Waste Management and these training programmes were of help to guide them to adopt good practises in BMW in scientific manner. The Deputy Commissioner and Chief Executive Officer of Zilla Panchayat are well aware of these training programmes and have co-operated during the implementation of District Level training Programme.





Activities on management of blood spill and preparation of 1% hypochlorite solution

Hypochlorite Solution

A good response towards participation from HCEs of Dept. of Health and Family Welfare was received followed by Dept. of Animal Husbandry and Veterinary Services. A need for designing an exclusive training programme for veterinary sector was felt by the officials after they attended the training programme and such programme has been scheduled during November 2012 with support from EMPRI. However, getting good response from the private sector is still felt as a challenge (Fig 1).

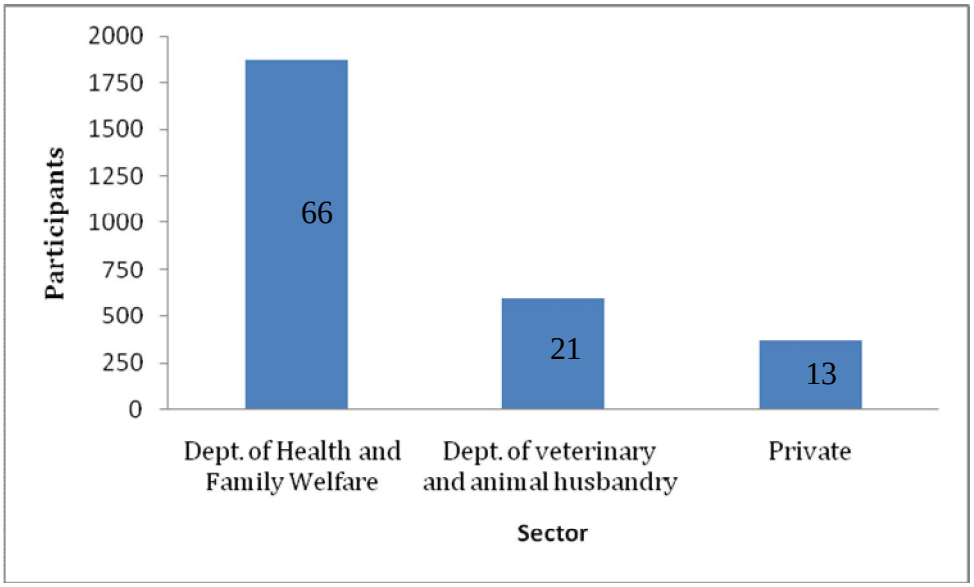


Fig 1: Percentage of various sectors trained

After the completion of programmes, distribution of health care personnel was studied. It was found that there were 32% nursing staffs and lab technicians, 29% doctors, 20% veterinary personnel, 15% D group workers and 4% AYUSH personnel (Fig 2). After every training programme, a high level of motivation among participants was achieved due to involvement of team members, resource personnel, representative from Department of Community Medicine of districts, officials from KHSDRP and KSPCB. Every training programme in districts were supported by providing resource persons from reputed and pioneer institutes in the field of BMW management like M. S. Ramaiah Medical College, St. Johns Medical College and Bangalore Medical College.

This has provided a very good platform to reflect on the issue and several methods of implementation to achieve compliance emerged. One such initiative was establishment of model hospitals demonstrating best practices in districts was supported by the stakeholders.

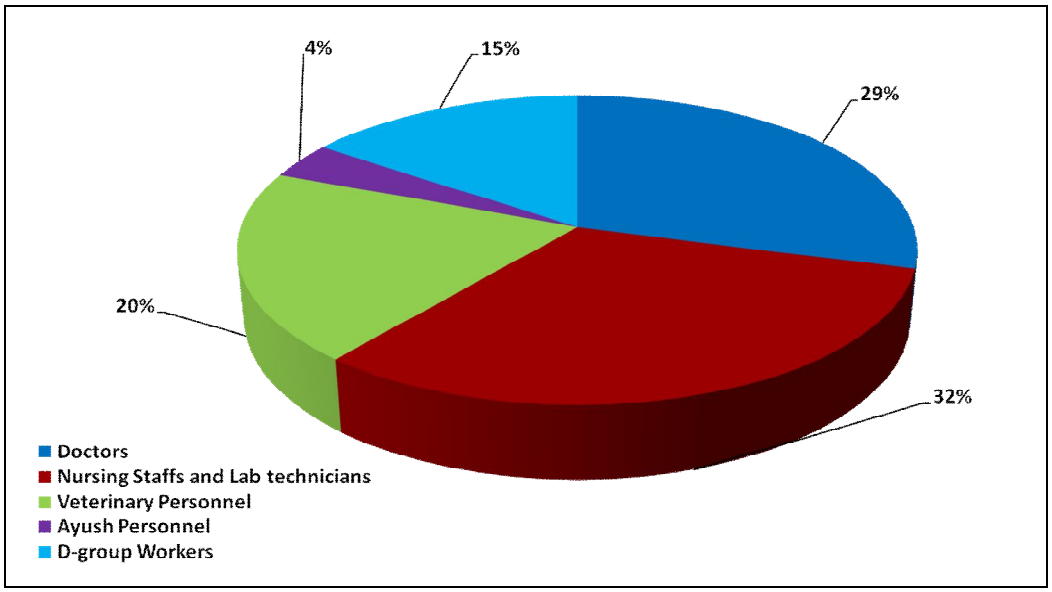


Fig 2: Percentage of personnel trained in various sector

LEARNING AND CHALLENGES

During the implementation of the training programme and interaction with the participants and stakeholders the following issues emerged which requires redressal through co-ordinated effort from Government and Private sector.

- To change the mindset of the HCE personnel especially at senior positions to consider safe disposal of BMW as important as treating a patient.
- Making hazards of BMW known to common people so that they demand its safe disposal.
- Strict enforcement of the Rules so that the HCEs take its implementation seriously. It is important that penal action is initiated against such HCEs who fail to implement the Rules.
- To explore viable options of non-burn technology for treatment of BMW.
- To decentralize Common Bio-Medical Waste Treatment Facility (CBMWTF) for benefit of rural sector.
- To standardize and explore viable treatment options for liquid waste management.
- To tie-up veterinary hospitals and animal house with Common Bio-Medical Waste Treatment Facility.
- To formalize disposal of household generated BMW.
- To commission study on situation analysis of BMW management in Department of Animal Husbandry and Veterinary Services and AYUSH.

On conclusion of the training programme an oath was administered to motivate the participants to reconfirm their commitment towards a cleaner planet.

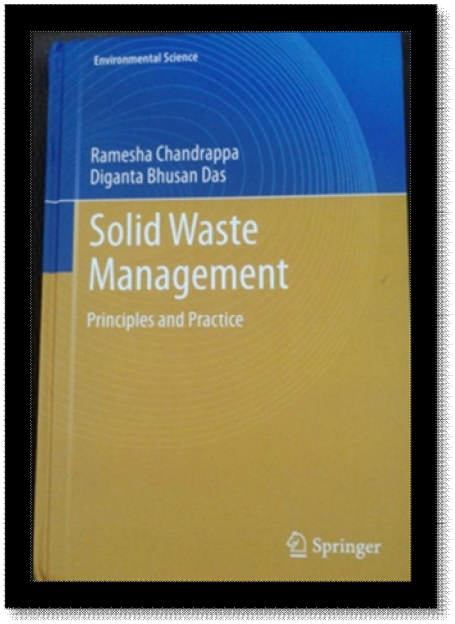
The Oath

"I am aware of the fact that unscientific disposal of Bio-Medical Waste is a health hazard and hence its treatment and disposal should be done in scientific manner. I shall therefore take all steps to ensure that such waste is handled without any adverse effect to human health and the environment. I shall therefore make effort to ensure compliance of Bio-Medical Waste (Management & Handling) Rules in order to achieve the objective"

Acknowldgements :

We would like to acknowledge inputs of Health Care Waste Management Cell, Dept of Community Medicine ,MS Ramaiah Medical College and Group of Hospitals, Bangalore Medical College and Research Institute, St.John's Medical College, Karnataka Health Systems Development and Reforms Project, Department of Health and Family Welfare, Dept. of Animal Husbandry and Veternery Sciences, GOK.

In particular, we wish to acknowledge Dr S Pruthvish and team, Dr Ramakrishna Goud, Dr Mahendra and Dr Asima Banu for the support extended.



BOOK REVIEW

SOLID WASTE MANAGEMENT: PRINCIPLES AND PRACTICE

Ramesh Chandrappa, Diganta Bhusan Das
[Springer Heidelberg, New York] 2012.
414 pages.

Price: 169.95 €
ISBN978-3-642-28680-3

Solid waste management is a major public health problem in most developed and developing countries. The reviewed book "Solid Waste Management: Principles and Practice" is an attempt by the authors to minimize the gap in print and on field. This book is a significant contribution to the knowledge on various aspects of management of solid waste as a whole.

The text is divided into 14 chapters which cover the information on various places of generation, storage, transport and management of solid waste in different settings. The chapters have been subdivided clearly into parts which are also in a logical sequence making the book easy to understand. The references are provided after each chapter which makes it easy for the reader to find materials for further reading. The illustrations and colorful pictures in the book make reading a pleasure and helps in comprehension of concepts. The book used simple language and as such it is easy to comprehend the materials in the book.

Starting from Chapter 1 (Introduction) the authors have tried to build up a detailed picture of solid waste management in the readers mind. The book also provides important statistics, e.g., it reports that the solid waste generated in the World according to a 2002 estimate is 900 million tons. The book is also unique in that it mentions about history

dating back to Romans. The authors have explained in great details regarding the nature of waste in Pre- and Post-industrialization era. The book has also addressed the financial issues of waste management. The variation in requirement of staff for management has been explained clearly with diagram. The explanation of Life Cycle Assessment which used an example of syringe and needle is informative.

In the subsequent chapter the factors determining the quantity and composition of waste in developed and developing countries have been discussed. Health Care Waste Management has been discussed with ease and clarity as well. A separate section is devoted for Household Hazardous Waste, which is found in Municipal Solid Waste draws the attention of reader to this subgroup.

It seems that the misconception that hazardous waste is generated only in urban and industrial areas has been removed to a large extent. The rural areas use more of insecticides for agriculture and chemicals in animal husbandry. The safety issues involved in each step of waste management has been elaborated extensively.

The authors have devoted a complete chapter on waste management during disaster. The challenges that a country goes through during a disaster is topped with waste management. The strategies have been mentioned. The book has given suitable examples where and when required. The case study on recent Russell market fire incident in Bangalore (February 2012) is informative.

“Unconscious mind is not the exception but is the rule”. The psychology and mindset of people from different backgrounds have been clearly explained.

Nearly 1% of the urban people depend on solid waste for their livelihood. The rag pickers, scrap dealers are some of the people involved in the informal waste recycling. An account on this is given.

Overall, this book is a very useful resource for public health specialists, environmental consultants, environmental journalists, scientists, regulatory agencies, legal and science policy professions and students of environmental science. The authorities managing the solid wastes of cities around the world would definitely benefit from using this book.

Dr. Chethana.T, Assistant Professor
Dr. Suman.G, Associate Professor,
Community Medicine Dept,
MSRMC,
Bangalore, India.

LETTER TO EDITOR

Dear Editor,

A review of the Journal of the Indian Society of Hospital Waste Management

ISHWM is the official organ of the Indian Society of Hospital Waste Management, a dedicated and only specialized journal addressing this critical health systems issue at national and SE Asia regional level.

This journal is widely consulted by researchers, public health consultants, public health administrators and healthcare industry (especially waste management equipment manufacturers) apart from undergraduate medical, dental, nursing and other health sciences as well as postgraduates of public health and health administration.

We have reviewed all the issues of journal published so far for its outlay and content format. Here are a few positive points and few areas for improvement

A. Positive points

- Glossy cover page with appropriate colour scheme.
- Use of relevant colours and clear depiction of the ISHWM Logo.
- Mentioning "Highlights" on cover page.
- A clear content list consistently on second page.
- The journal has evolved and improved over the years with respect to variety of articles and depth of interaction on certain issues.
- Inclusion of contemporary article, review article, reports and also serving as a useful resource.
- Content on back page is useful for a reader in hurry.
- Guidelines for authors in every publication.
- Page for notes at the end.
- Highlights presented in brief on cover page.
- Application form for membership of ISHWM society.
- Inclusion of photos of president and editor.

B. Few areas for improvement

- Include review articles.
- Have a discussion forum (to discuss select issue each time. Ex: use of needle destructors)
- An advertisement on last page is a distracter. This could be replaced by having the contents (as is being done for Vol 10, Issue 1, Sept 2011issue).
- To use the term original article instead of article.
- Interchanging of the term 'editor's page' and 'editor's note' could be avoided.

- Issue and Number used interchangeably, this could be avoided (Ex: vol 4, No 1, April 2005 vis-à-vis vol 10, Issue 1, Sept 2011issue)
- In general it lacks uniformity in mentioning and use of certain terms (ex: editor's note and editor's page; editorial board and editorial advisors).
- Interchanging of the term 'editorial advisers' and 'advisory board'

C. Few other suggestions

1. More original articles to be included
2. Report section to be concise
3. More articles to be included on research done in resource poor settings.
4. The journal is not indexed currently, an attempt to be made to get the journal indexed. This would attract more readers and quality articles for publishing.

Dr. Shweta Murali, Postgraduate in Community Medicine and Dr. B. Ramakrishna Goud MD, DIH, Department of Community Health, St. John's Medical College, Sarjapur Road, Bengaluru-560034.email: healthcarewaste@gmail.com.

PROCEEDINGS OF 11th ANNUAL CONFERENCE OF INDIAN SOCIETY OF HOSPITAL WASTE MANAGEMENT

HOSTED BY: HEALTH CARE WASTE MANAGEMENT CELL, M.S. RAMAIAH MEDICAL COLLEGE, BANGALORE, DEC 2ND – 4TH 2012

The Indian Society of Waste Management (ISHWM) was founded in 2001 with an aim to address the issues and concerns of hospital waste at the national level, and to facilitate/advocate/undertake research activities on issues of hospital waste management and eco-friendly disposal. This is 11th year since its inception and M.S. Ramaiah Medical College organized the 11th Annual Conference with the theme of "Value addition to Health Care through health Care Waste Management". Around 200 delegates attended the conference with participants from Bangladesh & Sri Lanka.

This annual conference was planned to have

- A pre conference CME/ Workshop on "Changing scenario in health care waste management"

- On day 2 and 3: conference which included scientific session on the sub themes for the conference and with paper presentation on work done by the delegates in the field of BMWs.

PRE CONFERENCE INAUGURATION:

Mr. Kanwar Pal Secretary, Dept. of Environment, Ecology and Forests, GOK inaugurated pre-conference CME. In his address to the delegates he mentioned that 32% of health care waste generated is not properly disposed. It is usually disposed in the municipal drains or kitchen waste or left in open places. He urged the delegates a draft of the deliberations of this conference can be sent to government so that new amendments can be implemented in the rules. The government expects practical, implementable recommendations so that the bottlenecks in the system can be overcome.

Dr. Kumar, President – Medical Education, Gokula Education Foundation (GEF) in his talk mentioned that the sensitization and implementation of HCWM has percolated into only 4% of workers, who have realized the need and the tangible benefits for HCWM. He opined that the workshop needs to be more interactive and conferences are a platform where young minds can be kindled and nurtured. Inauguration ended with Dr. Gautham, Jt. Organizing Secretary, ISHWMCON 2011 and Jt. Coordinator, HCWM Cell proposing the vote of thanks.

Forenoon sessions consisted sessions on enforcement status of Bio medical waste management rules in Karnataka, Issues in dental health waste management and challenges of waste management in small health care settings. Discussions that ensued after each of the presentations enhanced the understanding of the issues better.

Some of the points discussed included were need for permission from the pollution control board for use of newer technologies in managing waste, issues in disposal of dental waste such as plaster of Paris, heavy metals such as lead and mercury, setting up of systems to collect and manage waste by the common treatment waste facilities. One of the questions asked was if an incinerator had zero discharge can it be installed in the hospital for which it was replied that even though the discharge is zero it is tough to measure the amount of dioxins and furans, India does not have the facilities to do so hence it is better that in house facilities for incinerators be avoided.

Waste management in smaller health care settings is challenging be it solid waste or liquid waste. The quantity generated in smaller health care facilities being small the chances are likely that it might be neglected but in the long run the issue has to be addressed by establishing a system to collect and mange the waste effectively. The bio medical waste management rules state that the liquid waste needs to be disinfected and disposed. Dr. Ravishankar from Karnataka Health Systems Development and Reforms Project (KHSDRP) shared his experience in liquid waste management in smaller health care settings. The queries raised after the session was; how to check whether the effluent is disinfected? How much of disinfectant needs to be added to the effluent? Since the rules do not specify these, the speaker suggested equal amount of disinfectant could be added. Another issue raised was disposal of blood bags the issue was discussed at length but only experiences of delegates were exchanged and the discussion was inconclusive.

Dr. Gautham discussed at length difficulties in measuring the effects of dioxins and furans on human health. To prove the effects of dioxins and furans would also be difficult to establish due to lot of confounding factors. It could be done only by cohort study.

Dr. Riyaz shared a study done to measure the quantum of home health care waste. The options provided were to liaise with health care facility or with the common waste treatment facility for management of home health care waste.

CONFERENCE INAUGURATION

The inauguration of the conference was presided by the president of ISHWM. Dr. Saraswati G Rao Principal and Dean welcomed the guests of honor and the delegates. The Honorable Chairperson of Karnataka State Pollution Control Board delivered the keynote address and the souvenir was released by Dr. M.R. Jayaram, Chairman, Gokula Education Foundation and the journal of ISHWM was released by Air Mshl (Retd.) L.K. Verma AVSM, President of ISHWM.

The scientific session started with a discussion on Life cycle approach in medical waste management, Technologies for final treatment and disposal was the theme. Various aspects of the theme were discussed by six different speakers. The first topic was segregation to suit final treatment options or final treatment options to suit segregation system.

Presenters discussed at length how segregation could be simplified and what will make it easy to implement. The advantages of less number of categories was discussed i.e. - less cost; less confusing; All healthcare facilities may not require bins for all these categories; Waste handlers will know exactly what type of waste is to be put in which bin; Types of waste to be discarded in a particular bin could be clearly depicted, and not depend upon imagination of the nurses/ paramedics/waste handlers; Particular stream goes to intended terminal treatment option without any confusion.

Ms. Bineesha, Senior Advisor, GIZ presented on the options available for segregation and safe storage

There is technology involved in each facet of BMW starting from generation, how it is generated to final point of disposal. Segregation is the key to the whole management process as it separates infectious and non-infectious waste. One of the innovations discussed in the session was bar coded plastic liners to track the waste, storage facility for sharps and management of liquid waste.

Mr. Karunakaran, Senior Technical Supervisor, CPCB, Zonal Officer, Bangalore presented on Review of Technical and Technological Requirements and Implementation of Guidelines for Biomedical Waste Management. The presentation was concluded with the following points:

- Proper segregation is the 'core' of all functions & a change in the mindset & attitude is the key to success.

- The human element is more important than technology. Well trained, motivated staff can really work wonders

This session was followed by free paper session simultaneously in two halls, chaired by Dr. Pushpanjali, & Dr. Shalini Nooyi; Dr. Angadi & Dr. Hemanth respectively. A total of 15 free papers were presented. Dr. Sushma & Dr. Chetana were awarded Best paper and second best paper respectively. Mr. Vivekanand Bhatt was awarded Special jury award.

Afternoon Session

Mr. Philipp Sandheigl, METEKA Austria**,** presented on METEKA Hygiene & Infection Prevention System: Microwave

It consists of collection in a prick-proof container (reusable). Then HF-thermo disinfections within the collection and transport container and then followed by disinfection by micro waving and then waste can be disposed of as non-hazardous waste material. A compact technology that can disinfect, treat and render health care waste non-hazardous that can be disposed off safely is the need of the hour. Limitation of this technology was that chemically treated infectious waste cannot be treated; metals can also be fed into the system.

Dr. S. Pruthvish Professor and Head of Department of Community Medicine presented "Management of sharp waste: Issues and challenges". He discussed at length how sharps could be disposed safely and the method adopted in M.S. Ramaiah group of hospitals. He shared the usefulness of injury register, waste management register, Standard Operating Procedures, Segregation chart, spill kit, etc.

Dr. K. S. Baghotia presentation on Biomedical waste management in Delhi highlighted that hospitals in Delhi met over 90 percent criteria for authorization, collection and segregation, transportation and treatment of health care waste. Performance decline on criteria like awareness activities, waste audit, injury register, containment of mercury, spill management and SOP/guidelines was observed and there is scope for improvement in biomedical waste management in Delhi.

REPORT OF THE PROCEEDINGS OF DAY II OF THE CONFERENCE

The day two of the conference started with discussion on comments received on draft rules of BMW rules of 2011. The comments received from Ministry of Environment and Forests regarding each of the rules were discussed. Some of the comments were discussed and finalized. Dr. Suman, faculty department of Community Medicine, Dr. Nandimath, Professor, National Law school of India Bangalore and Ms. Bineesha, Chief Environmental Advisor GIZ Bangalore moderated the discussions.

The theme of plenary sessions for the day was Patient safety and worker safety the presenters discussed various aspects of the same. The salient features of the discussions following the presentations were

Can the use of personal protective equipment be improved among the workers of common waste treatment facility?

Can public act as monitoring agency to monitor the health care waste management? Which one - onsite or offsite facilities would be better for management health care waste?

The afternoon session of day II was dedicated to discuss the issues of capacity building and training.

Dr. Agarwal presented on how to build capacity by distance education and the efforts by Indira Gandhi National Open University in doing the same. The details of the certificate course offered on Health care waste management was presented and the advantages of the same were discussed.

Ms. Aswathy Kapil presented the details of training of the trainers taken up EMPRI to build the capacity of the officers involved in health care waste management at the district level. The advantageous and disadvantages of the same were discussed.

The conference ended with a valedictory function. The Bangalore declaration of Indian Society of Hospital waste management was presented by Dr Arjunan Isaac and approved by the members present with their suggestions and comments included.

We gratefully acknowledge the support from the management of Gokula Education Foundation and all our supporters and sponsors

- Rajiv Gandhi University of Health Sciences
- Medical Council of India
- Indian Council of Medical Research
- Consortium of Medical Engineering and Dental colleges of Karnataka
- Karnataka State Pollution control Board
- Pulse Medika
- SMS Enviroclean
- Semb Ramky Environmental Management Pvt. Ltd.
- Maridi Eco Industries Pvt. Ltd.

Compiled by Dr T Hemanth and Team
Organising Secretary
11th Annual Conference of Indian Society of Hospital Waste Management
Associate Professor Community Medicine,
Director, Health Care Waste Management Cell,
M.S. Ramaiah Medical College, Bangalore
Dec 2nd – 4th 2012

INAUGURATION OF PRE CONFERENCE WORKSHOP

Dr.S.Kumar, President Medical Education – GEF, Air Marshal Dr. L.K.Verma, President – ISHWM, Mr Kanwar Pal Secretary to Government of Karnataka, Environment & Ecology, Dr.Saraswathi G Rao, Principal & Dean, M S Ramaiah Medical College & Group of Hospitals

INAUGURATION OF CONFERENCE

The dignitaries on the dais for the inauguration of the conference (From L - R)
Dr. Sarswathi G Rao, Principal and Dean, M.S. Ramaiah Medical College
AVM (Dr) P. Tyagi, PMO, Air HQ TC , Bangalore
Air Marshal (Dr) Lalji K. Verma, President ISHWM
Dr. M.R. Jayaram, Chairman, Gokula Education Foundation
Mr.Gopalakrishne Gowda, Principal Secretary, Medical Education,GOK
Mr. A.S. Sadashivaiah, Chairman, KSPCB
Dr. D.V. Guruprasad, IPS Retd, Chief Executive, Gokula Education Foundation
Dr. Mutz, Director, GIZ, Bangalore
Dr. Hemanth, Organizing Secretary, 11th Annual conference ISHWM

VALEDICTORY FUNCTION

Valedictory function declaration of the conference closed by Air Marshal Dr. Lalji K Verma. Sitting on the dias Left to Right T Hemanth, Organizing Secretary, ISHWMCON 2011, Air Cmdre M K Bedi, Vice President, ISHWM, Dr. K.S. Bhagotia, Secretary, ISHWM, Dr. S. Pruthvish, Organizing Chairperson, ISHWMCON 2011

BANGALORE DECLARATION
SAFE MANAGEMENT OF HEALTH CARE WASTE MANAGEMENT AND INFECTION CONTROL:- A CALL FOR URGENT ACTION

We the participants of the 11th Annual Conference of the Indian Society of Hospital Waste Management (ISHWM) comprising of members of ISHWM, health professionals from Government, Private, NGOs and Civic society sector met in Bangalore on the 2nd, 3rd and 4th of December at M S Ramaiah Medical College Bangalore and deliberated at length the situation of health care waste management in the country and discussed the challenges to effectively and efficiently implement policies, provisions under different legislations and programmes for safe management of health care waste.

The situation of Health Care Waste Management in large and medium settings has made some improvements and amongst smaller settings the systems has improved minimally. Key challenges include dissonance between systems within and outside the health care setting, inadequate attention to health care personnel safety, inappropriate attention to patient safety and environmental safety, difficulties in managing hazardous and toxic substances particularly dental health care settings, neglect of home or domestic health care waste, non inclusion of non-traditional health care settings (tattoo centers, acupuncture centers, ayurvedic, unani and homeopathy centers), poor systems for management of expired drugs. There is a need to develop specific guidelines and usher appropriate systems both within and outside health care situations.

We the delegates conscious of the advances made, concerned about slow progress and eager to bring better systems of management hereby declare and give a call for urgent call for action in the following areas.

Management of waste in health care settings

a. Ensure segregation and disinfection at points of generation, secured containment and transportation and link with safe and sound final disposal options.

b. Train staff in different aspects of waste management, correct use of personal protective equipments and guarantee post exposure prophylaxis

c. Develop standard operating protocols and initiate reporting systems for accidents, needle-stick injuries and waste audit.

d. Mandate practice of universal (standard) precautions by doctors, nurses and support staff.

e. Designate a nodal person for waste management, who is formally trained.

f. Phase out mercury from the setting

g. Usher in take back policy system for e-waste, used equipments, pressurized canisters, etc.,

h. Consumers should be involved in better management of health care waste.

Common Bio-medical Waste Management Operator

a. Ensure pre-placement and periodic health checkups of all the staff at the facility.

b. Ensure appropriate training for staff in the area of Safe and sound handling of waste and ensure use of personal protective equipment.

c. Ensure notification of illness, post exposure prophylaxis and health and social welfare measures of the staff of common Bio-Medical Waste treatment facilities and transport staff.

d. Ensure transparency in operations including proper documentation of temperature recordings, log book of the processes, and related matters of services offered, cost incurred, facilities available and area of coverage using different methods including a dedicated website.

e. Guarantee continuous and regular up-gradation of facilities, equipment and use of safe, sound and eco-friendly technologies for the management of Bio-Medical Waste.

f. Support capacity building programmes particularly short term and periodically in the area of operation.

Other stakeholder including Government, Private and NGO sector and civil society representatives including media

a. Make adequate budgetary provisions (minimum of 1% of the total budget of hospitals and health care settings) for safe and sound health care waste management.

b. Develop training manuals, training methods and training material – audio video etc., to support and enhance knowledge attitude and practice of health care professionals in the field of health care waste management and infection control.

a. Establish apex, regional, district level training institutes and training mechanism related to health care waste management and infection control.

b. Strengthen introducing attitudinal change, knowledge and skill development in the areas of environment, health care waste management and infection control in the training of health care personnel include health care workers, doctors and nurses. Innovative capacity building mechanisms like the IGNOU – WHO distance learning, could be leveraged to the advantage.

c. Bring non-traditional systems of health care like, ayurvedic, unani and homeopathy centers under regulation.

d. Bring set ups like tattoo centers and acupuncture centers, under regulation.

e. Enhance research into environmental health, environmental pollution and its adverse impact on human health, solutions for the effective technologies and mechanisms for safe and sound management of health care waste.

f. Co-operate in the development of mechanisms for safe and sound management of health care waste generated in the household and community environments.

g. Media to make partnership with health professionals and provide for good and bad practices adopted by professionals.

h. Manufactures of equipment, disposables to take up the responsibility in research and in promoting environment friendly products and regularly upgrade their technology periodically.

[**Dr Arjunan Issac, Associate Professor, Community Medicine, M S Ramaiah Medical College, Bangalore presented at the end of the conference. It was discussed and consensus arrived at]**

RESOURCES AND INFORMATION

IGNOU CERTIFICATE COURSE

INDIRA GANDHI NATIONAL OPEN UNIVERSITY

Indira Gandhi National Open University (IGNOU), the largest open university in the democratic world, was established by an act of Indian Parliament in 1985, and started offering academic programmes in 1987 (Diploma in Management and Diploma in Distance Education with 4528 students). Today, it serves the educational aspirations of about 1.3 million students in 30 countries, including India, through eleven schools of studies and a network of 57 regional centres; five sub regional centres, 1296 study centres/tele-learning centres, 35 partner institutions overseas. The University offers 101 certificate, diploma, degree and doctoral programmes comprising 900 courses, through a strength of 300 faculty members and academic staff at the headquarters and regional centres and about 33,000 counselors drawn from conventional institutions of higher learning, professionals from various organizations and bodies, among others.

The University has been in existence for only two decades. In such a short time, the University has contributed significantly to higher education and continuing professional development in the country catering to the· education of about 12 per cent of total students enrolled in higher education (and more than 50 per cent of total students in distance education) in the country. As a world leader in distance education, it was conferred the Centre of Excellence Award in Distance Education in 1993.

SCHOOL OF HEALTH SCIENCES

The School of Health Sciences was established in the year 1991 as one of the eleven schools of the University. Its prime objective is the development and delivery of programmes in the field of medicine, nursing, paramedics through distance education mode and the maintenance of their academic standards. The Certificate Programme in Health Care Waste Management is one of the latest programmes developed in the School for the South-East Asia Countries.

CERTIFICATE IN HEALTH CARE WASTE MANAGEMENT

The concern for bio-medical waste management has been felt globally with the rise in deadly infections such as AIDS, Hepatitis and indiscriminate disposal of health care waste. The United Nations through UN Basel Convention on the control of transboundary movements of hazardous wastes and their disposal has classified health care waste as most hazardous waste, after radioactive waste.

According to WHO, the eleven South-East Asia countries together produce some 3,50,000 tons of health care waste per year, close to 1000 tons a day. As it is not segregated at source, all of it is to be considered hazardous despite the fact that only 10-20 per cent is infectious in nature (Health Situation in the South-East Asia Region, 1998· 2000, WHO, 1999).

The main bottleneck to sound health care waste management programme is lack of training and appropriate skills, insufficient resource allocation and lack of adequate equipment. The need to educate different health care professionals/ workers, NGOs and other stake holders was thus identified as a priority. To cater the needs of these health care professionals, IGNOU and WHO, SEARO decided to develop and launch Certificate Programme in Health Care Waste Management in the South-East Asia Region Countries. This programme is a 14 credit 6-month certificate programme, through open and distance learning.

This certificate programme has been developed to create essential knowledge and skills in health care waste and equip the leaders to manage it effectively and safely and also safeguard the community against adverse health impact of health care waste.

OBJECTIVES

- Sensitize the learner about health care waste and its impact on our health and environment.
- Acquaint the learner about the existing legis1ation, knowledge and practices regarding infection control and heath care waste management practices in South East Asia Region Countries.
- Equip the learner with skills to manage health care waste effectively and safely.

BENEFICIARIES

Doctors, Nurses, Paramedics, Health Managers and other professiona1 workers with a minimum of 10 + 2 qualification.

PROGRAMME PACKAGE

It is a multimedia package consisting of print material in the form of booklets called blocks, audio-visual materials, teleconferencing and providing counseling by contact sessions where the learners are invited to the Programme Study Centres in India and Partner Institutions in other countries for hands on training. The package will have eight theory blocks, a project and programme guide.

BHM-001 Fundamentals: Environment and Health,

Health Care Waste Management Regulations

Block 1: Understanding Our Environment 1

Unit 1 Introduction to Environment

Unit 2 Environmental Pollutants

Unit 3 Interrelationship of Environment and Health

Unit 4 Waste Management

Block 2: Health Care Waste: Definitions 1

Unit 1 Definitions, Types and Categories of Waste
Unit 2 Principles of Health Care Waste Management
Unit 3 Handling Health Care Waste

Block 3: Need for a Sound Health Care Waste Management 1

Unit 1 Impact of Health Care Waste on Our Environment

Unit 2 Impact of Health Care Waste on Human Health
Unit 3 Safety Methodology, worker Safety and Precautions

Block 4: Current Status of Health Care Waste 1 Management legislation in SEAR Countries

Unit 1 Rules and legislations

Unit 2 Regulatory Mechanisms

Unit 3 Current Status in India. Thailand. Indonesia. Sri Lanka. Bangladesh

Unit 4 Current Status in Bhutan, DPR Korea, Timor Leste, Maldives, Myanmar, Nepal

BHM-002 Health Care Waste Management Concepts, Technologies and Training

Block 1 Practical Aspects of Health Care Waste Management 2

Unit 1 Managerial and Administrative aspects
Unit 2 Integrated Infection Control Management
Unit 3 Disinfection and Transportation
Unit 4 Capacity Building. Training and Monitoring

Block 2: Systems and Technologies in Health Care Waste Management 2

Unit 1 Systems Options
Unit 2 Treatment and Disposal of Health Care Waste: Burn Technologies
Unit 3 Treatment and Disposal 01 Health Care Waste: Non burn technology
Unit 4 Innovative Concepts and Possibilities

Block 3: Health Care Waste Management and Emerging Issues 1

Unit 1 Managing Waste Water from Health Care Facilities
Unit 2 Management of Wastes from Immunizations
Unit 3 Occupation and Patient Safety
Unit 4 Success Stories

Block 4: Training Manual for Waste Handlers 1

BHMP-001 Project 4

CREDIT SYSTEM

In IGNOU parlance, the study hours are measured in credit system. One credit is equivalent to 30 learning hours. For example, 14 credits of Certificate in Health Care Waste Management programme means an average student will be required to give 420 hours (14 X 30) of input for this programme which includes theory reading, undertaking a project, hands on training, video viewing, counseling etc.

IMPLEMENTATION PLAN 2006

The programme will be implemented through a network of Programme Study Centres (PSCs) in India and Partner Institutions (PIs) located in other South-East Asia (SEA) and other countries. These Programme Study Centres and Partner Institutions will be located in health care institutions like medical colleges, hospitals, district and private hospitals, rural health centres, etc. A team of trained teachers called counselors will be identified and trained for providing academic counseling and supervising the Programme Study Centres/Partner Institutions. The

administrative control will be through the Regional Centres (RCs) of IGNOU located usually at state capitals nationally, by the Partner Institutions, and Indian Consulate in other countries and the School of Health Sciences (SOHS) located at the IGNOU Headquarters, Delhi. India.

EVALUATION

Evaluation will be through theory and project evaluation. 70 per cent weightage will be kept for theory term-end examination and 30 per cent for project evaluation. 50 per cent minimum pass mark in each component separately is required for successful completion of the programme.

Term-end examination of theory will be held twice in a year i.e. June and December. There will be no practical examination.

ADMISSION INFORMATION

Admission Fee: Rs. 2000/- in India
US$ 150 for other SEA countries

Eligibility: Doctors, Nurses, Paramedics, Health Managers and other professional workers with a minimum of 10 + 2 Qualification

Duration : Minimum 6 months
: Maximum 2 years

Launched : January 2006

Session : January to June
July to December

For further information contact:

Prof. S.B. Arora
Director
School of Health Sciences
Indira Gandhi Ni'ltional Open University
Maidan Garhi, New Delhi-110 068
Phone: (011) 29533078, EPABX 29535923·32
Fax: 29534935
Email: sohs@ignou.ac.in

INDIAN SOCIETY OF HOSPITAL WASTE MANAGEMENT

(Founded – 2000, registration under the Societies Registration Act XXI of 1860, Reg No. 36939 of 2000)

The Government of India published a Gazette notification on 20 July 1998 making all personas who generate, collect received, store, transport, treat, dispose or handle medical waste in any form responsible for handling the medical; waste without an adverse effect to human health and the environment. Consequent to the publication of above Gazette Notification on Bio-Medical Waste Management. It is mandatory for all hospitals and health institutions to implement the rules.

Since Hospital Waste Management is a perpetual problem, it was felt that there should be an all India Organization/Society comprising of experts/specialists from various disciplines involved in Hospital Waste Management. This Society should provide conceptual guidance and oversee scientific research for further development.

With this important aspect in mind, the Registrar of Society at Delhi was approached for registration of the 'Indian Society of Hospital Waste Management (ISHWM)' and the Society came into existence on 10th April 2000 and registration under Societies registration Act XXI of 1860 with Registration Number 36939.

The aims and objectives of the Society are as follows:

(a) To promote and advance the knowledge in Environmental Protection with special reference to Hospital Waste Management/ It also envisages promotion and improvement in public health. Protection to the environment, hospital and 'individual through the practice and education in the subject's dealings with the said subject.

(b) The subject of Environmental Protection and Hospital Waste Management involves multidisciplinary approach and involves active participation by specialists of various disciplines such as pathology, Microbiology, Hospital Administration, Preventive & Social Medicine. Therefore, it will function to bring together specialists from various disciplines under a roof with a common goal a personal and environmental protection.

(c) To propagate education and inculcate awareness in hospital as well as general population.

(d) To advance research in various field, connected with Environmental Protection and Hospital Waste Management.

(e) To function as an interface with Industries involved in designation/manufacture of bio-medical waste disposal equipment/appliance for R&D development India.

To fulfill and further the above objectives the Society shall

(a) Hold periodically meetings, seminars, workshops, training courses and annual conference of the members of the Society.

(b) Conduct workshops, training courses etc. separately for the benefit of the beneficiaries such as general public,

hospital waste handlers, patient & their relatives.

(c) Publish and circulate a journal on Hospital Waste Management and Environmental protection.

(d) Maintain a library at the location of the permanent officer as a when established.

(e) Generate funds from all possible sources. The funds so generated will be utilized for advance in the knowledge of disposal of waste and environmental protection. Scholarships and Awards for outstanding contributions will be judged on merit by a special board of officers nominated from time to time.

(f) Propose to the government the laws and regulations in respect of disposal of waste from the hospitals and environmental protection.

(g) Create and assist State-wise branches to propagate the objectives all over the country in a methodical and systematic manner.

EMBLEM & LOGO

The Emblem of the Society has been aptly designed to convey the message of environmental protection by confining hazardous hospital waste. The concept of the Emblem is:-

Hospital waste management uses four colours namely – Green, Black, Yellow and Red (Coding colours) used for bags to collect and dispose of hospital waste.

Hands: The two figures over the top and bottom denote the hands in light brown outlined with black to denote the hands, which stand for the control and management of waste.

Syringe: The syringe has been used as a symbol to represent hospital waste due to its extensive use in clinical practice.

Biohazard: Hospital waste is a serious biohazard hence the universally accepted logo for biohazard appears in the backdrop.

Tree & the Blue background: denote the Eco friendliness, which is very important while disposing of hazardous, waste.

Summary: the Logo depicts the hospital waste (syringe), which is a biohazard to the community being efficiently managed (by hands) in an environmental friendly (tree and blue background) manner.

ISHWM: Indian Society of Hospital Waste Management.

Please visit our website: medwasteind.org for details including memberships forms.

GUIDELINES FOR AUTHORS

JOURNAL OF THE INDIAN SOCIETY OF HOSPITAL WASTE MANAGEMENT

1. Journal of Indian Society of Hospital Waste Management publishes original articles, case reports, review articles, editorials, contemporary issues/agendas book reviews and other related scientific information towards Safe Management of Health Care Waste.

2. Articles are accepted for publications with the understanding that their contents. (All or in part) have not been published and will not be published elsewhere, except in the abstract form or with the consent of the Editor. Journal of Indian Society of Hospital Waste Management does not accept any responsibility for the statements made by the authors. The Editorial Board has the right to introduce such changes in the write-up as may be considered necessary for effectiveness of communication.

3. Following CERTIFICATES (Original Single copy) must accompany the articles.

(a) Certificate from Authors

(i) Certified that I/we have not used any information or material from official documents graded 'restricted' and above or any 'classified' information obtained in any my/our official capacity in the preparation of the article of the article title.

(ii) Certified that this manuscript contains no matter that is libelous or otherwise unlawful, or invades individual privacy or infringes on any proprietary rights.

(iii) All authors certify that they have made substantive and intellectual contributions to the article and assume public responsibility for its content.

(iv) It is also certified that none of the material; in this manuscript has been published previously or is currently under consideration for publication elsewhere.

Signatures of

First author	Second author	Third author
Date_____	Date_____	Date_____

5. **MANUSCRIPT** must be typed in double space throughout, on one side of good quality white bond paper of size 22x28 cm or A4 size with margin on both sides. Words should be hyphenated at the end of a line. Three copies, soft or hard should be submitted along with 3 sets of illustration and the entire text in MS Word format on a CD. Authors must retain a copy of all the above material, as the Journal cannot be held responsible for its loss due to any reason. The material should be enclosed in a large envelope, superscripted 'Article for Publication Not to be Folded', and sent under registered cover to Editor in Chief, Journal of Indian Society of Hospital Waste

Management, Health Care Management Cell, Department of Community Medicine, M. S. Ramaiah Medical College, Bangalore - 560 054. (Karnataka).

5. **PROCESSING**: Material received for publication will be acknowledged. The article may be reviewed by referrers. When required, one copy of the typescript, suitably modified, will be sent to the principal author for revision and resubmission in duplicate. Accepted articles will be published in their turn. Reprints (at least 10) of each article will be sent free cost to the FIRST author. Articles not accepted for publications will be returned by ORDINARY post.

6. **AUTHORSHIP: Should be restricted to persons who have made sufficient contributions to (a) conception and design (b) drafting the article or revising critically (c) final approval of the article to be published. All conditions must be ideally met. The order of authorship should be joint decision of all the coauthors.**

7. **TYPESCRIPT: the typescript comprises (a) title page (b) abstract and key words (c) text (d) illustrati**ons. All these must start on separate pages and ion the above order. Pages should be numbered consecutively beginning with the title page.

(a) Title page: gives the title of the articles a short title for page heading, type of article (original article, case report etc), name(s) of the author(s), affiliations of author(s), place of work, names and address of the authors (including PIN Code and FAX). Ideally, the title should be of about 60 characters. It should have no abbreviations. Names of all the authors with highest academic degree must be typed one below the other with proper footnote marks after the name. Affiliations (with corresponding footnote marks at the beginning) and addresses of authors should be typed as footnotes only.

(b) Abstract and keywords - The abstract is a synopsis of the main article in about 200 words and gives an opportunity to the author to induce the reader to go through the article. It must give the purpose, methods, results and conclusions of the study, giving facts and not descriptions. Speculative surmises, and references to other works on the subject should be included. Avoid abbreviations. No abstract is required for case reports. Below the abstract give not more that 5 key words using terms from Medical Subject Headings list of Index Medicus.

(c) Text - The text should be divided into sections, e.g. Introductions, Materials and Methods, Results and Discussion. Each should have it individually and must not be mixed with other. Ensure that all references, tables and figures are cited in the text.

(d) Reference - The Journal follows the Vancouver style as used by Index Medicus system of references.

(e) Legend - to illustrations should be brief (rarely exceeding 40 words), but must explain the salient features of the illustrations.

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the Journal of The Indian Society of Hospital Waste Management to be addressed to:

Editor in Chief
C/o. Department of Community Medicine, M S Ramaiah Medical College,
MSRI T Post, Bangalore - 560 054, India
Phone: 91-080-23600968, Fax: 91-080-23606213 E-mail: hcwmcell@rediffmail.com