LITERATURE REVIEW

Role of various Pollution Control Boards;

The Ministry of Environment and Forests, Government of India in exercise of powers conferred by sections 6,8,25 of Environment (Protection) Act 1986 has notified waste(management and handling)rules 1998on 27 July 1998. The rules were amended on 6 March 2000 and 2 June 2000. The purpose of these rules is to arrest widespread dissemination of communicable diseases by managing medical waste. It also mitigates this transmission in handlers of medical waste.

At state level, Maharashtra Pollution Control Board (MPCB) has been notified as “Prescribed Authority” to implement statutes of Central Government in this regards. Similarly Regional Office of Pollution Control Board, first floor, Udyog Bhavan, Nashik is the Prescribed authority.

A medical fair was held at Pragati Maidan New Delhi from 25-26 March 2011. This showcased all aspects of medical waste management.

D’Silva Jeetna(2000) and few others immediately on declaration of clause of Prescribed Authority have raised objection about veracity. Very strangely, hospitals in Maharashtra are required to apply for treating medical waste. This application is time wasting, costly and riddled with red-tapeism like many other governmental requirements. The basis of charging fees is not standardized, hence hospitals try to avoid the very application. Presently the charging ratio is linked with cost of hospital infrastructure and not with cost of facilities to be provided. In Ophthalmology hospitals not much waste is generated, but in gynaecology hospitals hospital waste is voluminous. Therefore charging both hospitals same fees for similar infrastructure is definitely unjustified. This needs to be changed, and at the earliest. Similarly, it is unviable for NMC to handle small scales of bio-medical wastes generated in some clinics, remote areas as it is not cost-effective. Annual reports of Maharashtra Pollution control Board, and Regional office of PCB, Nashik also elucidate on hospitals/clinics defaulting in regards to registration for medical waste management. Penalty of Rs one lac and/or imprisonment has been laid down for not abiding by statutes in this regards. Medical units of all types and sizes are required to segregate medical waste from generic, and then dispose off. Hardly 20% of medical units are
actually abiding by above statute. The monthly/annual waste collection data at facility at Tapovan is clear example for this.

Times of India, Nashik Edition, April 2012. Mr AS Fulse MPCB Regional officer in his interview accepted that Nashik is 45th amongst 88 most polluted cities in India, and 6th in State of Maharashtra. He also accepted issuing show cause notices to Saykhedkar Hospital in CIDCO and NMC’ S Zakir Hussain Hospital in Kathada on 31 March 2011 and 17 September 2011 respectively.

NEWS(2006) published by Indlaw.com states that Bombay High Court has directed Maharashtra Pollution Control Board(MPCB) to survey 366 government hospitals in the states and initiate an action against those who were found violating the bio medical waste disposal rules and to submit the report by December 2006..

The order was issued by the court on hearing PIL filed by consumer Welfare Association complaining that the Government hospitals were not following proper procedure for disposal of bio-medical waste. An example was cited by petitioners counsel Rajiv Chavan that one of the hospitals in Baramati still uses pit burial method for bio medical waste disposal.

**Generation of solid waste, segregation of medical waste from generic waste;**

Basic Document of WHO gives unit wise generation of bio medical Waste ;

- OPD; Bandages,plastics,sharps
- Injection Room; solids,sharps,injections
- General Ward; solid sharp, soiled waste
- Emergency Ward; Sharps,solids,soiled waste
- Labs; Placenta,soiled,solid,sharps
- ICU; Sharps,soiled,solid
- Labs; solid,soiled,,oiled,cultures

Draft City Sanitation Plan for Nashik from 2012-2052 deals with almost all aspects of hospital waste management in Nashik in a phased manner.
Detail Project report for Solid Waste Management, 2006 for Nashik also dealt with application of all aspects of hospital waste management.

Nasima Akhter-Environmental Engineering Programme, School of Environment, and Development (Jan 2000) Asian Institute of Technology, Thailand. This deals with generation of waste in many countries in the world.

**Segregation;**

P Hanumantha Rao; Report HWM-Awareness and Practices. He has carried out detailed study in 3 states of Maharashtra, UP, and Andhra. The issue of segregation practices and status is main finding of this voluminous study.

Segregation of medical waste at source is the first and main step towards having a sound waste management program in any hospital. It helps in ensuring that quantity of waste needing special attention is considerably reduced and is more manageable and cost effective. Many researches have been done in this direction.

Varkey Peter, K in Cochin; and Srisanthil in Trivendrum in 2000 and 2004 respectively have shown that both these cities in Kerala are much advanced in field of medical waste segregation.

Jatani Prachi 2004 in “hospital crisis blame game continues in Mumbai.” Has come out with observation that incorrect colour coded bags are used in Mumbai in hospitals of her survey.

Chaithra, Bharthi, and Manjunath (2004) carried out a cross sectional investigation in Aug, Sep 2004 in few hospitals of Bangalore, and were shocked to see awareness levels of staff.

From above and practically today also lackadaisical attitude of hospital agencies can be seen towards segregation. Primary reasons are finance, poor awareness and loss of monitoring by all agencies.

**Infectious sharp waste disposal;**

Sharps are responsible for major threat of risk of blood borne diseases from biomedical waste. In medical tool kits many things form sharps- like syringes, needles, scalpel blades, catheters, glass vials, used slides, cutting piercing tools.
Sheikh Parveen 1999 surveyed two hospitals in Mumbai and found no special emphasis on disposal of sharps. This results in spread of Hepatitis B, and AIDS. These must not be available to rag pickers, children, drug addicts. Puncture proof bags must be used to store these, but no one does so.

Environment council 1999 undertook comparative study for disposable versus durable devices in operating theatre suites. Major findings are; that disposable system had a significantly higher negative impact upon the environment than durable ones in form of energy consumption, resource depletion and contribution to environmental problems as global warming, acidification and toxicity to humans. Disposable systems are costly.

Desai Rajni(2010) conducted a study where 91% of doctors agreed that improper disposal was responsible for spread of communicable diseases.

Correspondent of Focus Hyderabad Healthcare (2002) highlighted the menace of recycling medical waste. 13 out of 17 brands of syringes do not fall under required standards.. Rag pickers are responsible for recycling medical waste enroute to disposal area.

Anurupa MS, Suryakant and Vijai kumar (2005) have researched in Devangere, Karnataka. They concluded that teaching hospitals were more aware towards management of sharps. Liquid waste was disposed off into underground sewage system without pre-treatment.

**Training**

Paryavaran Sevak and Runambandh both in Marathi are magazines for environmental awareness by MPCB. For this MPCB got Environment Leadership Award by US-ASIA Environment Partnership.

Central Pollution Control Boards runs workshop for managing hazardous chemicals..

Public Citizens Charter has been made for Management of MSW.

A film has been made by Government medical college Jammu along with Messers Medicom Networks, New Delhi. The name of this training film is ‘Future Begins With Us”. It was released by the then minister of Environment and Forests, Mr A Raja on 06 January 2006.
Razia Sultana, Project Director Environment Protection Training and Research Institute (EPTRI), Hyderabad, 2009. In this document all aspects of training have been dealt with in the form of self learning document for drivers, superintendent, administrators. This has been in support from World Health Organisation (WHO).

World Health Organisation (WHO) main document on Healthcare Waste Management (HWM) establishes principles of:-

“Polluter pays”

“Duty care”

“Proximity”

“Prior Information”/ also called cradle to Grave Principal.

“Registration of all stakeholders”.

Another central government initiative is Environment Protection Training and Research Institute. It imparts training on all aspects of medical waste management.

Technologies.

During expert committee Central Pollution Control Board at New Delhi on 07 July 2011 Mr Timothy Spencer of Positive Impact Waste Solution Texas recommended PIWS-3000- a technology involving shredding followed by chemical disinfection using calcium Hydroxide. This technology has been given go ahead for one year licencing in India.

RH Khwaz, MoEF said till 2010 there were 86 mechanised compost plants, 20 vermi compost plants, 2 refuse.

Glen Macrae in “Basic overview of Developing countries-Medical Waste Treatment, strategy, and technology has suggested three new non burn technologies:-

Chemicals
High heat technologies-plasma torch, pyrolysis

Low heat ( Autoclaving, microwave, hydroclave)

California Department of Public health has released list of approved technologies for incinerating medical waste. This is applicable from 07 July 2012

Shila Khan Nishat in MSW, Fuzzy AHP (19 January 2012) has recommended fuzzy analytic hierarchy process.

**Impact on community/society;**

SRISHTI an NGO in Delhi has been agitating for long against burn technology in autoclaves.

THE HINDU April 2004 has given in Editorial that incinerators are the biggest pollutants in Autoclaves.

RTEMIS Health Institute, Gurgaon spearheads in June 2012 infection control Programme. She specializes in quality control in labs, healthcare, worker safety and hospital acquired infections. She is instrumental in getting Asia pacific hand hygiene excellence award 2010-11. This is the only hospital in India to get this award.

NEERI Study in 2004. This studied 174 people staying next to Gorai dumping ground. The study revealed 9.2% increase in asthma and eye irritation. This propagated concept of Advance Locality Management(ALM) so that segregation is done at source.

Dignity Foundation of senior citizens has also been roped in Mumbai. 600 senior citizens are keeping watch on conservancy sections, and motivate staff awareness in students. Exposure to blood borne diseases(BBD). It results in 16000 Hepatitis C, 66000 Hepatitis b virus, and 200-500 HIV annually.

**Pre-treatment of medical waste before Disposal;**

Chemical disinfection of sharps before disposal is most important. There are limited studies in this case, Some are enunciated in subsequent paragraphs.
Kankhal Ashok Ghulab, 1999 found that 50% of the municipal and government hospitals disinfect their medical waste before disposal with Formalin or Hypochloride. Sharps are disinfected only in some cases. Cultures and pathology are not disinfected even in most large hospitals.

Dolas Sanjai Kumar, 2001 studied medical waste practices in Rajawadi Hospital, Mumbai and found sharps treated with 2% hypochlorite solution before disposal as per proper guidelines.

Srinivas V Chari, 2002 of Centre for Energy, Environment, Technology, Hyderabad revealed the fact that biomedical waste was collected in open bins. Even infectious body fluids are washed without prior disinfection.

**Transportation and Storage of Biomedical waste;**

Kulkarni Saurabh (Nov 2011) has talked about service corridors in hospitals to carry waste up to last bin and collection area.

RK Khwaza, MOEF, New Delhi (Mar 2010), Report of committee to evolve road map on management of waste in India. In ‘Performance audit Report on management of Waste in India’ report by CAG, Acharya DB has enunciated three precautions for transportation, viz:

- Direct contact with medical waste should be avoided.
- Bags should not be overfilled and emptied into other bags.
- Transportation must only be done in authorized vehicles.

NEERI Study on MSW in 3 cities of Maharashtra, viz Nashik, Pune, Nagpur was conducted in 2004. It opined that many vehicles were used for transportation of MSW. In case where transportation distances were large, transfer was done from smaller vehicles to larger vehicles enroute. However, since this was not done under supervision it left room for improvement.

**Common Treating Facility provided by Municipality.**

Nashik Municipal Corporation (NMC) has installed a common treating facility at Khalp Prakalp, Nashik. Most medical establishments use common treatment facility for disposal of medical waste. This has been permitted by Central Pollution Control Board to cut down cost impact at small medical facility centres.
Krishna Kumar 2003 in his article, "Hospitals ask relatives to dispose off limbs” of relatives in Mumbai after amputation as they have no facility for same. The contractors collection was irregular hence this appeal by medical care centres.

Deepa .A(2003) in her article BMC lax in picking up medical waste writes that Additional Commissioner has been receiving many complaints from doctors as disposal not regular. He therefore increased his physical presence to improve situation in this regards.

Anurupa M, S Suryakant, and Vijai Kumar,2005 revealed that all teaching hospitals and nursing home authorities felt the need for common incinerator in Mumbai.

Prasad KV 2007 observed that for one year common facility at Oratukuppai burns bio medical waste only from private hospitals. Government hospitals had not joined in for want of clearance for the charges they have to pay.

**Disposal of bio-medical Waste in Municipal Bins;**

Despite payments being made the bio medical waste of every medical institution is not collected with same regularity. Therefore agencies are forced to dump waste anywhere.

NSS Unit of Mithibai college, 1999 revealed that 61% of clinics wrapped their waste in plastic bags and put them into municipal vans. A Gulab (1999) observed that some agencies disposed off their waste to raddiwalas as well.

**Dynamics;**

AS Amanullah, Dhaka University(2009), in paper on Attitudes, Practices, Humans has propagated a Health Belief Model(HBM) in respect of demographic variables, informational, occupational practices. He postulates that perceived susceptibility, severity and benefits improve with education.

M Cherul, Tanaka M, Shekdar AV,23 Mar 2007; This is one of most technical model in this field so far. Authors have written that dynamics is inherent in number of beds and Not In My Backyard Syndrome(NIMB). A simulation model has been suggested by these authors. They have suggested population, waste generation, NIMB as important attributes.
MSW composition is heterogeneous. Dynamics also gets affected by season and geographical variations. Other factors like population growth, consumer behaviour, new treatment methods,