ASSESSMENT OF THE EXISTING KNOWLEDGE , ATTITUDE AND PRACTICES (KAP) REGARDING BIO MEDICAL WASTE MANAGEMENT AMONG THE HEALTH CARE WORKERS AT CANTONMENT GENERAL HOSPITAL , DELHI CANTT

(24 Feb-18 May 2016)

Internship and Dissertation Report
Submitted in Partial Fulfillment of the Requirements for the Award of

Post-Graduate Diploma in Health and Hospital Management

Batch 'G' (2014-16)

By

Col Pradeep Choubey
(On study leave)

Under the guidance of

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International Institute of Health Management Research,
New Delhi

2016

TO WHOMSOEVER IT MAY CONCERN

1. This is to certify that Col Pradeep Choubey student of Post graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management and Research, New Delhi has undergone internship training at Cantonment General Hospital , Delhi Cantt from 24 Feb to 18 May 2016

2. The candidate has successfully carried out the study "**Assessment of the existing Knowledge , Attitude and Practices (KAP) regarding Bio Medical Waste management among the Health Care workers at Cantonment General Hospital ,Delhi Cantt"** , which was designated to him during the internship training and his approach to the study has been sincere , scientific and analytical .

3. The internship is in fulfillment of the course requirements.

4. I wish him success in all his future endeavors.

DR Ashok Kumar Agarwal
Dean Academics and Student Affairs
IIHMR Delhi

MS Kirti Udayai
Assistant professor and Assistant Dean
IIHMR Delhi

CERTIFICATE OF APPROVAL

The following dissertation titled **"Assessment of the existing Knowledge , Attitude and Practices (KAP) regarding Bio Medical Waste management among the Health Care Workers at Cantonment General Hospital ,Delhi Cantt" is** hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a pre requisite for the award of Post Graduate Diploma in Health and Hospital Management for which it has been submitted . It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made , opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name	**Signature**
(1) Dr. Shyama Nagarajan	
(2) Ms. DIVYA AGGARWAL	
(3) Vanishree M.R.	

CERTIFICATE FROM DISSERTATION ADVISORY COMMITTEE

This is to certify that Col Pradeep Choubey, a graduate student of Post - Graduate Diploma in Health and Hospital Management has worked under our guidance and supervision . He is submitting this Dissertation titled **"Assessment of the existing Knowledge , Attitude and Practices (KAP) regarding Bio Medical Waste management among the Health Care Workers at Cantonment General Hospital ,Delhi Cantt "** at IIHMR , Delhi, in partial fulfillment of the requirement for the award of the Post Graduate Diploma in Health and Hospital Management. This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph , report or book.

MS Kirti Udayai

Assistant Dean and Assistant Professor

IIHMR Delhi

For Cantonment General Hospital

Dr MK Hira

CMO Delhi Cantt

Cantonment General Hospital
Delhi Cantt

Dated : 18th May 2015

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Col Pradeep Choubey has successfully completed internship training in the department of Operations from 24 Feb to 18 May 2016

During the tenure of his association with the organisation , we found him actively participating in hospital activities and keen to learn different aspects of Operations and Administration in the Health care industry.

We have found him sincere , hard working and focused towards the assignments given to him

We wish him all the very best for future endeavors

Dr. Manjinder Kumar Hira
Senior Medical Officer
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18/5/16

For Cantonment General Hospital
Delhi Cantt
Dr MK Hira
CMO

Cantonment General Hospital

Delhi Cantt

Date : 18th May 2016

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Col Pradeep Choubey has satisfactorily completed his internship and Dissertation in the hospital from 24 feb to 18 may 2016

During his tenure , he has successfully completed the project on the topic titled **"Assessment of the existing Knowledge , Attitude and Practices (KAP) regarding Bio Medical Waste management among the Health Care Workers at Cantonment General Hospital ,Delhi Cantt**

Throughout the training he has been a regular and keen learner . His performance during the training period was excellent.

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FEEDBACK FORM

Name of the Student : Colonel Pradeep Choubey (Indian Army)

Dissertation Organisation : Cantonment General Hospital, Delhi Cantt

Area of Dissertation : Operations (Bio Medical Waste Management)

Attendance: Full

Objectives achieved: Adequately achieved

Deliverables : -

Strengths: A sincere effort , a meticulous study and analysis of issues with tremendous zeal .

Suggestions for improvement: To continue with the same zeal.

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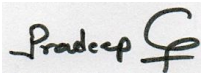
Signature of the Officer -in - charge / Organisation Mentor

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "**Assessment of the existing Knowledge , Attitude and Practices (KAP) regarding Bio Medical Waste management among the Health Care Workers at Cantonment General Hospital ,Delhi Cantt"** and submitted by Col Pradeep Choubey, Enrolment No. PGDHM/2014/045 under the supervision of **MS Kirti Udayai**, for the award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from 2**4 February to 18 May 2016** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.



Col Pradeep Choubey)

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ACKNOWLEDGEMENT

I express my gratitude and sincere thanks to MS Kirti Udayai, Assistant Professor and Assistant Dean and my mentor at International Institute of Health Management and Research, New Delhi, for her valuable guidance and co-operation in my Endeavour. I also express my sincere thanks to Dr Ashok K Agarwal, Dean Student affairs at IIHMR and Dr A K Khokkar , Dir IIHMR for their esteemed support and guidance .

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I would be failing in my duty if I don't express my sincere gratitude to Dr Gurdev Singh , Chief Medical Officer (in charge) , Cantonment General Hospital, for his foresight and generous support, without which I wouldn't have been able to set my objectives for my Dissertation. My heartfelt thanks to the complete staff of Cantonment General Hospital for professional guidance at all stages. My sincere thanks to Dr MK Hira, CMO and Senior Medical Officer at Cantonment General Hospital , whose mentoring and guidance during the Internship provided me with an opportunity wherein I improved my understanding of all departments of a hospital during the three months training and was able to complete my dissertation. I was given opportunity to be part of all departments which helped me in observing the functioning of various departments. I would also like to thank Dr Praveen Singh , in charge of Bio - Medical waste disposal in the Hospital for his support . The training schedule ensured that there was adequate in-build flexibility provided to me to understand finer aspects of hospital management. Thus the Internship-cum-Dissertation training has equipped me with an expertise which will ensure my appropriate employability as hospital administrators within and outside the Army.

Col Pradeep Choubey
(on study leave)

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ACRONYMS / ABBREVIATIONS

CGH	-	Cantonment General Hospital
BMW Rules	-	Bio-medical Waste (Management & Handling) Rules
CBWTF	-	Common Bio-medical Waste Treatment Facility
HCW	-	Health Care Workers
CPCB	-	Central Pollution Control Board
EC	-	Environmental Clearance
ETP	-	Effluent Treatment plant (ETP)
BMW	-	Bio -med Waste
HCFs	-	Health Care Facilities
HW (M, H & TM) Rules	-	Hazardous Waste (Management, Handling & Trans-boundary Movement) Rules
MoEF	-	Ministry of Environment & Forests
PCC	-	Pollution Control Committee
PLC	-	Programmable logical control
SPCB	-	State Pollution Control Board
TSDF	-	Treatment Storage and Disposal Facility
HW	-	Hazardous Waste
TOC	-	Total Organic Carbon
VOCs	-	Volatile Organic Compounds
BMW	-	Bio Medical Waste

SECTION 1: INTERNSHIP REPORT

SECTION 1: INTERNSHIP REPORT

(Feb-May 2016)

Introduction

Delhi Cantonment falls near Janakpuri area of New Delhi in the southwest district. All the four major transport modes are easily accessible to the residents of nearby regions. Other nearby areas include the airport, Dwarka, Dhaula Kuan, Tilak Nagar, Vasant Vihar, Naraina, JanakPuri, R K Puram, Shanti Niketan and Westend. Delhi Airport is within 5 km from Delhi Cantonment. Delhi Cantt. itself has a railway station. All the trains plying from Delhi towards Rajasthan or Gujarat do stop here. This region is also served by the Janakpuri/ Tilak Nagar metro station under Delhi Metro. DTC buses are also available from major railway stations. [1]

The Delhi Cantonment was established by the British in the year 1914. Till Feb 1938, the Cantonment Board Delhi used to be known as Cantt authority. The area of the Cantonment is 10,791.88 acres. At the 2001 India census[3] Delhi Cantt. had a population of 124,452. Males constituted 61% of the population and females 39%. Delhi Cantt has an average literacy rate of 77%, higher than the national average of 74%: male literacy is 83% and, female literacy is 68%. In Delhi Cantt., 12% of the population is under 6 years of age. At the 2011 India census Delhi Cantt. had a population of 116,352. Males constituted ~58% (67,703) of the population and females constituted ~42% (48,649). Delhi Cantt. has an average literacy rate of 91.11%, higher than the national average of 79.9%: male literacy is 94.54% and, female literacy is 86.26%. In Delhi Cantt., 11.36% of the population is under 6 years of age. [2]

The Delhi Cantonment is as Class I Cantonment Board. Presently, the Cantonment is governed by the Cantonments Act, 2006 and various Policy letters and Instructions of the Ministry of Defense, Government of India issued from time to time. Though the Board functions as a local municipal body, yet it is under the administrative control of Directorate General Defense Estates, New Delhi and Principal Director, Defense Estates, Western Command, Chandigarh. [3]

The Cantonment Board consists of eight elected Members, three nominated Military Members, three Ex-officio Members (Station Commander, Garrison Engineer and senior executive Medical Officer), one representative of the District Magistrate. An officer of the Indian Defense Estates Services which is a central civil service is posted as the Cantonment Executive Officer (CEO) as well as the member secretary of the Board. The board is headed by the President Cantonment Board (PCB) who is the Station Commander and also presides over the meetings of the cantonment board. The Station Commander of the Army is the Ex-officio President of the Cantonment Board. At present **Brig. Jai Singh** is the President of the Cantonment Board Delhi.

The term of the elected Members is of 5 years. The Vice President is elected from amongst the elected.

Organizational Profile

Cantonment Board Hospitals have been raised in all Cantonments of the country to look after the civilian population living in and around the cantonments . These hospitals come under the Local Cantonment Board headed by a Chief Executive Officer (CEO) who is an officer of Indian Defense Estates Service cadre of Civil Services and works under the administrative control of Director General, Defense Estates, Govt. of India, Ministry of Defense. **Sh. B Reddy Sankar Babu, IDES** is the Chief Executive Officer of Delhi Cantonment Board at present.

One of the mandatory functions of the Cantonment Board is to provide the basic health cover to the civilian population of Delhi Cantonment Area. The board has been performing this through Cantonment General Hospital located at Sadar Bazar, Delhi Cantt.

Cantonment General Hospital **(CGH)** provides the basic health cover to the civilian population of Delhi Cantonment Area. [4] The Hospital made a modest beginning from

Figure1.1 : 100 Bedded Cantonment General Hospital

one of the barracks of the old base hospital building at Sadar Bazar, Delhi Cantt. The hospital was shifted to its present location in 1963 .The hospital is a **100-bedded unit (**under extension) at present, providing general medical and primary emergency care services including **Laboratory**, **X-ray** and **Delivery services.** The hospital is managed by the permanent staff consisting of a CMO, 4 general duty doctors, a dental surgeon and other doctors on contractual basis. It hasa full-time **dental clinic ,** part-time **visiting specialist** of dermatology and ophthalmology. It has limited IPD services. It has in its premises a **Health Post of Delhi Govt** which provides Maternal and Child Health Services including Antenatal Care and Immunization Services. It also has the **DOTS Centre of Delhi Govt** providing treatment of tuberculosis. An **AYUSH clinic** run by Central Council for Research in Homoeopathy (CCRH) is also functional on daily basis. The hospital carries out **Birth & Death Registration**, an important function of Delhi Cantonment Board. It is implementing all the **National Health Programs** including Pulse Polio Program, School Health and Tuberculosis Control. [5]

Mission, Vision and Values

The hospital has not developed any mission, vision or value statement

Structure of the Hospital -

The General hospital is housed in a Three floor building with the following constitution :-

Ground floor - Has the Reception and Registration centre , Emergency ,

Casualty room , Ortho , Gynecology , Ophthalmology , ENT ,Medical , Psychiatric , Skin , Ayurvedic and Homeopathic OPDs , Minor OT , Radiology (X ray & USG) , ECG room, Immunization and Injection room , Family planning Counseling room , Labor room , Physiotherapy room, a DOTS centre , main Pharmacy ,Dressing room and Plaster room

Figure 1.1: Cantonment General Hospital Building - An over view

The first floor has the Administrative block , Dental department , Path Lab , Pharmacy store , Ayurvedic store , Family ward (18 beds) and a conference room .

The Second floor has the Major OT , VIP rooms(06 beds) , Private wards (06 beds) , Male ward (20 beds) and CSSD

The Basement has the AC plant, Linen store , Furniture store , Pump house and Generator set

Figure 1.3: The Mobile Dispensary and Ambulance fleet of CGH

Ambulances - The hospital has two mobile dispensaries to cater for distribution of medicines and critical care in remote areas of the cantonment .It has two BSA and one ALS.

Staff

The hospital have the following staff :- The hospital is headed by a CMO (Incharge) under whom are the following staff :-

- **Permanent** - Doctors - 04 , Nurses - 02 , ANM - 04 , Technicians - 02 ,

  Pharmacist - 02 , Administrative staff - 13

- **Contractual** - Doctors - 28 , Nurses - 35 , Technicians - 18 , Pharmacist - 04 , Administrative staff - 06

Outsourced Services

The hospital has outsourced the following services

- Security - 30 persons
- House- Keeping and waste disposal - 60 persons

Services not catered for in the Hospital

The hospital has not catered for the following services :-

- Blood Bank
- Mortuary

Departments

Cantonment General Hospital provides care through the following Departments:

- General
- Orthopedics.
- Obstetrics & Gynecology
- Pediatrics
- ENT
- Gastro
- Surgical
- Skin
- Ophthalmology
- Medicine
- Clinical Nutrition
- Dentistry
- Psychiatry
- Cardio
- Onco
- Physiotherapy
- Ayurvedic
- Homeopathic

Services

- Preventive Health Check
- Radiology
- Path and Lab
- Anesthesia
- Gen Immunization
- Maitri (AIDS)
- Care for Senior Citizen
- DOT centre
- Kishori Clinic
- School Health

Observations

During the Internship period I was attached with various Departments of the Hospital . Working in a Delhi Government hospital being administered by Cantonment Board was a pleasant experience . The hospital is being well administered under the present CMO . The major observations and recommendations based on the general analysis of data and observations during the internship period and visits to various departments, which can go a long way in improving the Hospital is as under :-

Services related

- There is already a daily foot fall of 500 persons attending various OPDs in the hospital and the trend is that the strength will increase as the quality of services will improve .
- Most of the patients are from middle class, or the lower strata of the society as the hospital is catering to the civil population staying in the cantonment area.
- OPD services are the main stay of the hospital and start early in the morning at 0800h , lunch break is at 1300h , hospital continues till 1500h
- A huge rush is there at the registration as well as near the OPD area which has most of the consultant rooms . There is less rush at the Dental , Ayurvedic and Homeopathic OPD area as they are in different locations .
- There is a common waiting area in the gallery, during the OPD time the patients and their attendants are seen standing in the gallery due to the limited seating capacity . There is a requirement to create a bigger waiting area with token number display system to reduce the rush and stream line the OPD system
- There are some Sign boards showing the details of facilities in the hospital, fire prevention measures , hand washing rules, actions to be taken during an Earthquake etc but there is still a scope of more sign boards for easy understanding of the patients .
- Registration for the OPD is done at the registration counter on two windows where a person has to give his demographic data , which is then fed on the computer at the desk . A yellow slip is physically filled and given to the patient directing him to report to the specific specialist or to a general physician. Once registered the OPD slip is valid till six months . There is a requirement to automate the registration process to reduce the rush as also to ease the data management and billing
- Once the patient is seen by the specialist he gives a white chit containing the prescription or an investigation slip if required , this slip can be given at the Pharmacy and medicines can be collected .The prescription is also entered in the patients yellow slip for record .
- The registration counter does not have any automated system which could ease the billing and registration process and collect the data for future analysis .
- There is also a requirement to introduce EMR in the hospital

- At the pharmacy there are three windows and not much rush was seen . Most of the prescribed medicines were available in the pharmacy. The pharmacy has an efficient system of storage and accounting of medicines however there is a need to introduce an automated system which could give real time details of medicines available in the pharmacy to the consultants and assist the pharmacy to monitor the stock and expiry details.
- Emergency casualty services are functional 24 x 7 however the ICU is not yet functional . It should be made functional .
- The housekeeping and security services have been out sourced. There is a high level of cleanliness in the hospital and security staff both male and female were found to be doing their task efficiently.
- The Lab , Physiotherapy services, Dental , Ayurvedic and Homeopathic clinic were found to be popular and well subscribed.

Staff related

- A major portion of the staff were found to be working on contractual basis hence the staff turnover ratio was also found to be very high which effects the efficiency of the hospital . It is strongly recommended to have a 50:50 ratio of permanent and contractual staff .
- The hospital has some state of the art medical equipment like Laparoscope, OT Table etc but due to lack the expertise of specialist Surgeons and Doctors these equipment has not been used. There is a requirement of carrying out a gap analysis and developing a proper roll on plan for expansion and a coordinated procurement of the equipment and appointment of the staff as per standards of a 100 bedded hospital.

Misc

- Use of IT. There is legal requirement of keeping hard copies of the medical document; however, the feasibility of increasing the usage of IT throughout the hospital should be encouraged without compromising on the legal requirement of keeping hard copy of medical documentation

- Formation of Quality Circles. Quality Circles should be formed among Resident Doctors, Nursing Staff, House-Keeping, etc so that the experience available amongst the people working on ground is shared amongst themselves for overall benefit of all stake holders.
- Increase the pre-induction training period of the new staff and regular structured refresher training for the complete staff.

- Involving of functional staff in the Audit of all departments as first step in the Audit of processes. For that the staff from both medical and non medical departments can be detailed for carrying out audits on the monthly basis. This can help in the self assessment by the staff and bring in behavioral changes.

SECTION 2: DISSERTATION

ASSESSMENT OF THE EXISTING KNOWLEDGE , ATTITUDE AND PRACTICES (KAP) REGARDING BIO MEDICAL WASTE MANAGEMENT AMONG THE HEALTH CARE WORKERS AT CANTONMENT GENERAL HOSPITAL ,DELHI CANTT

Executive Summery

Hospitals in the country have still not achieved the desired standards of BMW management in spite of the rules and regulations being in place since long. As per the rules of 1998 HCF are required to treat their BMW taking care of the segregation , packing ,storage ,transportation and disposal. Keeping a record of the data on waste generation and disposal is also essential . [6]

The absence of proper waste management, lack of awareness about the health hazards from Bio Medical waste, insufficient financial and human resources, and poor control of waste disposal are the most critical problems connected with health care waste . The issue of BMW management is just about caching up speed in the country and more emphasis is on proper waste management as the Health sector is now looking up due to increasing earnings from Medical Tourism . Few of the private sector and some renowned government hospitals have started taking stock of the waste management but majority of the hospitals are still lacking far behind due to poor audit by the enforcing authorities.

This study was carried out to assess the Knowledge , Attitude and Practices (KAP) of Bio medical waste management by HCW of CGH in Delhi Cantt. The hospital is a basic level 100 bedded government hospital undergoing expansion in terms of beds ,facilities and staff. The outcome given in the study are based on data which was collected and collated based on observation unstructured interviews and inputs from a structured questionnaire given to randomly selected HCWs .

The study has tabulated the inputs in the form of tables and analysed the data in the form of graphs and finally some relevant recommendations have been given for improving the KAP of the HCW in the CGH .

The awareness level was found to be high among the Doctors and Technical staff but lower in some aspects in the Nurses who were possibly new inductees and Sanitary Staff due to their poor education level as also due to less role till collection of BMW .

The Attitude of the HCW was positive towards implementing the BMW management rules and their willingness to undergo training on all aspects of BMW management. The HCW were found lacking in the practice of few very important aspects like Needle Stick injury management , reporting and keeping a record of the same .The level of immunization against Hepatitis - B is very low and needs to be strictly implemented .

Awareness and practical handling of BMW can be substantially improved by carrying out training of new inductees , refresher training of the existing staff as also periodical and surprise internal assessment of the practical aspects by the higher administration . Even the Sanitary staff who have been outsourced need to be put through training and their compliance also needs to be audited

This study has identified the gaps in the KAP of the HCW involved in BMW segregation collection and disposal process and recommended measures to overcome those gaps.

CHAPTER 1: INTRODUCTION

Background

Medical practices generate large amounts of cotton, plastic, latex, glass, sharps, body parts, blood and other materials, much of which may be contaminated with body fluids .Hazards arising from waste disposal from medical practices can be divided into two main areas. First, there is the environmental burden of a variety of hazardous products and second, the more immediate risks of potentially infectious material that may be encountered by the individuals handling waste.

Indiscriminate disposal of BM or hospital waste and exposure to such waste poses a serious threat to the environment and to human health. BM waste requires specific treatment and management prior to its final disposal. The severity of the threat is further compounded by the high prevalence of diseases such as human immunosuppressive virus (HIV) and hepatitis B and C .

Hospital-acquired infections have been estimated at 10% of all fatal/life-threatening diseases in the South-East Asia region and have been identified as one of the indicators for the management of waste. Alarmingly, the World Health Organization(WHO) reported a 50% re-use in India of syringes and needles that are meant for single use .[7]

In India, the Ministry of Environment and Forests has promulgated the Biomedical Waste (Management and Handling) Rules 1998 for proper management of BM waste. These rules are meant to improve the overall waste management of health care facilities in India . However, the introduction of laws is not sufficient for proper disposal of BM waste. The awareness of these laws among the general public as well as development of policies and enforcement that respect those laws are essential .

What is Bio- Medical Waste?

Bio - medical waste consist of solid, liquid, sharps and laboratory waste that are potentially infectious or dangerous. It differs from other types of hazardous waste such as industrial waste. Common producers of bio-medical waste are hospitals, health clinics, nursing homes, medical research laboratories, offices of physicians, dentists and veterinarians.

As per Bio- Medical Waste (Management and Handling) Rules, 1998, and as amended "Bio-medical waste" means 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 and including categories mentioned in Schedule I. The schedule I includes human anatomical waste, animal waste, microbiology & biotechnology waste, waste sharps, discarded medicines and cyto-toxic drugs, soiled waste, solid waste, liquid waste, incineration ash and chemical waste. [8]

As per *WHO norms* the health-care waste includes all the waste generated by health-care establishments, research facilities, and laboratories. In addition, it includes the waste originating from minor or scattered sources such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc.).In general the bio medical waste / health care waste, (the term bio medical waste is used in India and the health care waste term is used by WHO, both means the same), contains non infectious waste and infectious waste. The infectious waste includes pathological waste, sharps waste, items contaminated with blood and body fluids and chemical , pharmaceutical waste etc. As regards to the category wise percentage of waste generation, non infectious waste is 80% , pathological and infectious waste 15% , sharps waste 1 % , chemical or pharmaceutical waste 3 % and others 1 %.

Risk from Bio-Medical Waste If Not Managed Properly

All individuals exposed to bio-medical waste are potentially at risk of being injured or infected. They include Medical staff: doctors, nurses, sanitary staff and hospital maintenance personnel;In and out patients receiving treatment in healthcare facilities. Visitors of hospitals. Workers in support services linked to healthcare facilities such as laundries, wastehandling and transportation services. Workers in waste disposal facilities, including scavengers. The general public and more specifically the children playing with the items theycan find in the waste outside the healthcare facilities when it is directly accessible to them.

If bio-medical waste is not managed properly, it also causes environmental, occupationaland public health hazard.

Environmental Hazard

Inappropriate treatment and disposal of bio-medical waste contributes to environmental pollution, uncontrolled incineration causes air pollution, dumping in nallas, tanks and along the river bed causes water pollution and unscientific land filling causes soil pollution.

Occupational Hazard

A risk to all those who generate, collect, segregate, handle, package, store, transport, treat and dispose bio-medical waste. Occupational exposure to blood can result from percutaneous injury (needle stick or other sharps injury), mucocutaneous injury (splash of blood or other body fluids into the eyes, nose or mouth) or blood contact with non-intact skin. The most common form of occupational exposure to blood and the most likely to result in infection is needle stick injury. The most common cause of needle stick injury is two handed recapping and the unsafe collection and disposal of sharps waste. Over 20 blood born diseases can be transmitted but particular concern is the threat of spread of infectious / communicable diseases like AIDS, Hepatitis B & C, Cholera, Tuberculosis, Diphtheria etc. Waste chemicals, radioactivity and heavy metals etc. are hazardous to health.

Public Health Hazard

Poor management of bio-medical waste can cause serious disease to health-care personnel, to waste workers, patients and to the general public. The greatest risk posed by infectious waste is accidental needle stick injuries, which can cause hepatitis B and hepatitis C and HIV infection. There are however numerous other diseases which could be transmitted by contact with infectious bio-medical wastes. During the handling of wastes, injuries occur when syringe, needles or other sharps have not been collected in puncture proof containers. Inappropriate design and / or overflow of existing sharps container and moreover unprotected pits increase risk exposure of the health care workers, waste handlers and of the community at large, to needle stick injuries.

The reuse of infectious syringes represents a major threat to public health. The WHO estimated that in the year 2000 world wide, immunization undertaken with contaminated syringes caused about 23 million infections of Hepatitis B, C and HIV. Such situations are very likely to happen when bio-medical waste is dumped on an uncontrolled site where it can be

easily accessed by public. Children and rag pickers are particularly at risk to come in contact with infectious waste.

Worldwide, each year, the overuse of injection and unsafe injection practices combine to cause an estimated 8 to 16 million hepatitis B virus infection, 2.3 to 4.7 million hepatitis C virus infection and80,000 to 160,000 HIV infections. Among unsafe practices, the reuse of syringes and / or needles without sterilization is of particular concern. (Source AIDE-MEMOIRE, Safe Injection Global Network, Department of Blood Safety and Clinical Technology, WHO)

Advantages of Proper Management of Bio-Medical waste:

The proper bio-medical waste management will help to control nosocomial diseases (hospital acquired infections), reduces HIV/AIDS, sepsis, and hepatitis transmission from dirty needles and other improperly cleaned / disposed medical items, control zoonoses (diseases passed to humans through insects, birds, rats and other animals), prevent illegal repackaging and resale of contaminated needles, cut cycles of infection and avoid negative long-term health effects like cancer, from the environmental release of toxic substances such as dioxin, mercury and others.

Legal Framework

Various regulations which governs the waste management and the Bio- Medical Waste (Management and Handling) Rules. National Legislation is the basis for bio-medical waste management practices in the country. It establishes control and permits for the disposal. The regulatory frame work which governs the management of waste is as follows.

- The Water (Prevention and Control of Pollution) Act, 1974 (for liquid waste)
- The Air (Prevention and Control of Pollution) Act, 1981(for air quality)
- The Environment (Protection) Act, 1986
- Hazardous Wastes (Management, Handling and Trans-boundary Movement)Rules,2008 (for hazardous waste).
- The Bio-Medical Wastes (Management and Handling) Rules 1998 (for infectiouswaste , sharps waste, chemicals, discarded medicines and cytotoxic drugs etc.)
- The Municipal Solid Wastes (Management and Handling) Rules, 2000 (for domestic municipal waste)

- Battery (Management and Handling) Rules, 2001 (for used batteries waste)

Salient Features of Bio-Medical Waste (Management and Handling) Rules, 1998 and Amendment

The Bio-Medical Waste (Management and Handling) Rules emphasizes legal aspects and proper procedure of how to categorize, segregate, handle, transport, treat and dispose the bio-medical waste. 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 **"Occupier"** means in relation to any institution generating bio-medical waste, which includes a hospital, nursing home, clinic dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called, means a person who has control over that institution and / or its premises. The duty of every occupier of an institution generating bio-medical waste is to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.

No untreated bio-medical waste shall be kept stored beyond a period of 48 hours, provided that if for any reason it becomes necessary to store the waste beyond such period, the authorized person must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment. "Authorized Person" means an occupier or operator authorized by the prescribed authority to generate, collect, receive, store, transport, treat, dispose and/or handle bio-medical waste in accordance with these rules and any guidelines issued by the Central Government. The "Prescribed Authority" for enforcement of the provisions of these rules shall be the State Pollution Control Boards in respect of states and the Pollution Control Committees in respect of Union territories and all pending cases with a prescribed authority appointed earlier shall stand transferred to the concerned State Pollution Control Board or as the case may be, the Pollution Control Committees.

SCHEDULE I-

CATEGORIES OF BIO-MEDICAL WASTE TREATMENT AND DISPOSAL

Category No. 1	**Human Anatomical Waste**(human tissues body parts)	Incineration @ deep burial*
Category No.2	**Animal Waste** (animal tissues, organs) body parts parts carcasses bleeding parts, fluid blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge from hospital, animal	Incineration @ deep burial*
Category No.3	**Microbiology & Biotechnology Waste** (waste from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, and devices used for transfer of cultures)	Local autoclaving / microwaving / incineration @
Category No. 4	**Waste Sharps** (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This treatment includes both and unused sharps)	Disinfection (chemical treatment)@@ autoclaving microwaving and mutilation /
Category No. 5	**Discarded Medicines and Cytotoxic Drugs** (wastes comprising outdated, contaminated and discarded medicines)	Incineration @/destruction and drugs disposal in secured landfill drugs disposal in secured
Category No. 6	**Soiled Waste** (items contaminated with blood, and body fluids including cotton dressings, soiled Plaster casts, lines, bedding, other material contaminated with blood)	Incineration @ autoclaving microwaving
Category No. 7	**Solid Waste** (wastes generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets etc.)	Disinfection by chemical treatment @@ autoclaving /microwaving and

		mutilation shredding##
Category No. 8	**Liquid Waste** (waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities)	Disinfection by chemical treatment @@ and discharge into drains
Category No. 9	**Incineration Ash** (ash from incineration of any bio- medical waste)	Disposal in municipal landfill
Category No.10	**Chemical Waste** (chemicals used in production of insecticides, etc.)	Chemical treatment @@ and discharge into drains for liquids and secured landfill for solids

@@ Chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.

Mutilation/shredding must be such so as to prevent unauthorized reuse.

@ There will be no chemical pre-treatment before incineration. Chlorinated plastics shall not be incinerated.

* Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.

+Option given above are based on available technologies. Occupier/Operator wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down to enable the prescribed authority to consider grant of authorization.

Segregation, Packaging, Storage and Transportation:

The segregation, packaging, storage and transportation of bio- medical wastes are to be taken up in the following way.

Bio-medical waste shall not be mixed with other wastes.

- Bio-medical waste shall be segregated into colour coded containers / bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. The containers shall be duly labelled as per schedule III.
- If a container is transported from the premises where bio-medical waste is generated to any waste treatment facility outside the premises, the container shall, apart from the label prescribed in Schedule III, also carry information prescribed in Schedule IV. The schedule IV describes the type of waste where it is generated and to where it is being transferred. The schedule II and schedule III are as follows. [9]

Schedule II

Colour Coding and Type of Container for Disposal of io-Medical Waste

Color Coding	Type of Container – Waste Category	Treatment options as per Schedule I
Yellow	Plastic bag Cat. 1, Cat. 2, and Cat. 3, Cat. 6.	Incineration/deep burial
Red	Disinfected container/plastic bag Cat. 3, Cat.6, Cat.7.	Autoclaving/Micro waving/ Chemical Treatment
Blue/White Translucent	Plastic bag/puncture proof Cat. 4, Cat. 7. Container	Autoclaving/Micro waving/ Chemical Treatment and Destruction/shredding
Black	Plastic bag Cat. 5 and Cat. 9 and Cat. 10. (Solid)	Disposal in secured landfill

Notes:

1. Color coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.

2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.

3. Categories 8 and 10 (liquid) do not require containers/bags.

4. Category 3 if disinfected locally need not be put in containers/bags.

Schedule III

Label for Bio-Medical Waste Containers/ Bags

BIOHAZARDIC CYTOTOXIQUE : Handle with care

Note : Label shall be non-washable and prominently visible.

CHAPTER 2: REVIEW OF LITERATURE

KAP of BMW Management in CGH

Literature Related to Knowledge on BMW Management :

Waseem Q.et al (2007) conducted a study on awareness of bio medical waste management among the staffs of the Government SMHS hospital, Srinagar.150 questionnaires were distributed among doctors, nurses and the paramedical staffs respectively. The answers obtained in the form of positive and negative responses were subjected to statistical analysis using t test and chi-square tests P values of, 0.005 were considered significant. The result of the study revealed that among doctors there is enough knowledge regarding awareness about hazards of bio medical waste and risk of infection like hepatitis and AIDS. Definite positive response regarding the subject was 86% (p value= 0.005).Significant awareness was found among nursing staffs as well, who were found aware of possible health hazards of bio medical waste. Positive response regarding the subject was 58% (p value=0.05). However among paramedical personnel positive response regarding the subject was 11% (p value=0.05).The findings suggest that there is inadequate knowledge about the subject and poor concept of bio medical waste among the paramedical personnel.[10]

Jahnavi G, Raju P V, (2006) conducted a study on the awareness and training need of bio medical waste management among undergraduate students in ASRAM Medical College in Andhra Pradesh. Total 463 under graduate students (216 males and 247 females) were the sample. Most of the students have heard about bio medical waste. Some of them were aware that it causes health hazards. But knowledge about category of wastes, duration of wastes, Type of bag used for collection, identification of biohazard symbol was poor. There were gaps in various aspects of bio medical waste management among medical students. Appropriate training or inclusion of a topic in undergraduate curriculum can fulfill this.[11]

Kishore J. et al., (2000) conducted a study on awareness about medical waste management and infection control among dentists of a teaching hospital in New Delhi India. 64 samples were taken for study. Data collection was done by using a self-administered questionnaire. The result showed that not all dentists were aware of the risk they were exposed to and only half of them observed infection control practices. In addition to this, majority of them were not aware of proper waste management.[12]

Literature Related to Practice on BMW management

Rasheed S.et al., (2004) conducted a cross sectional study on hospital waste management in 8 teaching hospitals of Karachi to evaluate the current practices of segregation approaches, arrangements and collection and disposal system in the teaching hospitals of Karachi. The study was conducted by using convenient sampling technique. The instrument of research was a self administered questionnaire. Result of the study was out of 8 hospitals visited 2(25%) were segregating sharps, pathological wastes chemical infections, pharmaceutical and pressurized containers at source for handling potentially dangerous waste 2(25%.) Hospitals provided essential protective gears to its waste handlers. Only 1 (12.5%) hospital arranged training sessions for its waste handling staff regularly. 5 (62.5%)hospitals had storage areas but mostly it was not protected from access of scavengers.2 (25%) disposed of by municipal land fills and 1(12.5%) was burning waste in open-air without any specific treatment. No record of waste was generally maintained. Only 2(25%) hospitals had well documented guidelines for waste management and a proper waste management. The findings suggest that there should be proper training and management regarding awareness and practices of waste disposal. Research must be undertaken to seal existing gaps in the knowledge about hospital waste management.[13]

Sharma S , Chauhan S V (2004) conducted a study on assessment of biomedical Waste management practices in three apex government hospitals of Agra viz., Sarojini Naidu Medical College, Lady Lyall Maternity Hospital and District Hospital were studied during January 2004-January 2005. Data were collected with the help of personal observations of the waste treatment and disposal practices and assessment of knowledge, attitude and practices of working personnel with the help of questionnaires. The results obtained indicated lack of knowledge and awareness regarding legislations on bio-medical waste management even among qualified hospital personnel. None of these hospitals were equipped with higher technological options e.g. incinerator autoclave, microwave and had no facilities to treat the liquid waste generated inside the hospital. The findings suggest that generation and implementation of a waste management policy institutional/organizational set up, training and motivation must be given paramount importance to meet the current needs and standards of bio-medical waste management in these hospitals.[14]

Massrouje (2001) conducted a study on medical waste and health workers in Gaza governorates to identify the problem of medical waste management. Data were collected through a questionnaire (given to 400 health workers), in depth interviews and an observation checklist. The study was carried out in Governmental institutions in GAZA after formal approval from the Director General of the Ministry of Health. The samples were selected randomly. Results showed that the partial segregation for the sharps was observed in 89.5% of the places.78.6% were collected in special sharp boxes donated by the World Health Organization. Transport of medical waste was made in thin plastic bags and there were no colour coded bags .87% of study group declared that they new about medical waste. Profession was highly associated with knowledge of constituents, hazard categories and the occupational hazards of bio medical waste.($p<0.05$). Duration of employment was not associated with knowledge of the constituents of medical waste but was with knowledge of the hazard categories and occupational hazard of medical waste. Researcher found that some gaps in knowledge of health care workers and current practices are inadequate.[15]

Literature Related to Knowledge and Practice regarding BMW management in general.

Rao P H, (2008) conducted a study on awareness and practice of hospital waste management in Hospitals/nursing homes and private medical practitioners in urban as well as rural areas and those from the private as well as the government sector in Andhra Pradesh, Maharashtra and Uttar Pradesh in India. Information on awareness of bio-medical waste management rules, training undertaken and practices with respect to segregation, use of colour coding, sharps management, access to common waste management facilities and disposal was collected. Awareness of Bio-medical Waste Management Rules was better among hospital staff in comparison with private medical practitioners and awareness was marginally higher among those in urban areas in comparison with those in rural areas. Training gained momentum only after the deadline for compliance was over. Segregation and use of colour codes revealed gaps, which need correction. About 70% of the healthcare facilities used a needle cutter/destroyer for sharps management. Access to Common Waste Management facilities was low at about 35%. Dumping biomedical waste on the roads outside the hospital is still prevalent and access to Common Waste facilities is still limited. Surveillance, monitoring and penal machinery was found to be deficient and these require strengthening to improve compliance with the Bio-medical Waste Management Rules and to safeguard the health of employees, patients and communities.[16]

Mostafa GMA et al (2007) conducted cross sectional study at Almansoura university hospital, Egypt on the development of a waste management protocol based on knowledge and practice of health care personnel in surgical departments. 200 samples were taken for the study and data collection was done using a self administered questionnaire for nurses and doctors and an interview questionnaire for house keepers. Observation checklist was used for assessment of the performance. The result was only 27.4% of the nurses, 32.1% of housekeepers and 36.8% of the doctors had satisfactory knowledge. Concerning practice, 18.9%of the nurses, 7.I % of the house keepers, and none of the doctors had adequate practice. Nurses knowledge score had a statistically significant weak positive correlation with the attendance of training courses($r==0.23$, $p<0.05$).

The majority of the doctors, nurses, and housekeepers have unsatisfactory knowledge and inadequate practice related to health care waste management. The knowledge among nurses is positively affected by attendance of training programs. Based on the findings, a protocol for healthcare waste management was developed and validated. It is recommended to implement the developed waste management protocol for the surgical departments in the designed hospital, with establishment of waste management audits.[17]

Pandit N B et al,(2005) conducted a cross sectional study on management of biomedical waste : awareness and practice in a district of Gujarath.30 hospitals with minimum 30 beds were randomly selected from Sabarkanth district Gujarath.The doctors and auxiliary staff of those 30 hospitals were the study population. While all the doctors knew about the existence of the law related to biomedical waste. But details were not known. Doctors were aware of risk of HIV and Hepatitis Band C. Where as auxiliary staffs had very poor knowledge about it. There was no effective waste segregation, collection, transportation, and disposal system at any hospitals in the district. The findings suggest that there is an immediate and urgent need to train and educate all doctors and staffs to adopt an effective waste management practices.[18]

Saini S, Nagarajan S S, Sarma R K, (2005) conducted a study on knowledge, attitude and practice of biomedical waste management amongst staff of tertiary level hospital in India.. The tool used for collection of data was questionnaire which has semi-structured format with a set of 12 items concerning the knowledge, understanding and their behavior on the subject. . The staff included consultants, Residents, Scientists, Nurses, O.T. Staff, Sanitary staff and

Laboratory staff and was grouped as Group I to Group VII accordingly. 200 questionnaires were distributed and 156 (78%) were received back out of which 13% are from consultants, 16% from Residents, 14% from Scientists, 13% from Nurses, 14% from O.T. Staff, 14% from Sanitary staff and 16% are Laboratory staff. The results of questionnaire analysis showed that Consultants, Residents and the Scientists respectively have 85%, 81 % and 86% knowledge about the biomedical waste management rule. The knowledge component among the nurses have shown to be 60% and that of Sanitary staff, Operation theatre and Laboratory staff have respectively 14%, 14% and 12% awareness of the subject. The result of the study revealed that a significant gap was observed in the knowledge attitude and practice of the consultants, residents and scientists with regard to biomedical waste disposal, to their knowledge or understanding of the subject. The study suggested that intensive training programs at regular time interval for all the staff with special importance to the new comers. Need for orientation programs for newcomers to understand the hospital function. The entire waste management practices should be a part of total hygiene practice of the society rather than confining to hospital and health facility.[19]

Utility of Review of Literature - Review of various studies done on ascertaining the KAP of Health Care Workers on BMW Management reveal a trend of a sort about gaps in the knowledge of various HCWs , specifically Paramedics and Sanitary Staff . We also come to know the gaps in attitude in spite of change in the times. More importance is being given to BMW Management worldwide as well as in most of the Private sector hospitals in India but lot of attitudinal change needs to be brought about in the Public sector hospitals . ROL also reveals a gap between knowledge and practices of BMW Management. Most of the studies have also brought out the importance of regular training for improving the KAP in BMW Management. Owing to the study of existing literature on the subject the present study was able to focus on the issues of importance and develop tools to ascertain the KAP .

CHAPTER 3: AIM AND OBJECTIVES

Aim

Present study is being conducted to assess the Knowledge , Attitude and Practices about Bio Medical waste among HCW in the Cantonment General Hospital at Delhi Cantt.

General Objective

To Assess the existing Knowledge , Attitude and Practices (KAP) regarding Bio Medical Waste management among the HCW at Cantonment General Hospital Delhi Cantt.

Specific Objectives

The study has the following aims relating to the workforce of the Hospital

1.To explore the level of knowledge regarding Bio Medical Waste management as under:-

- Awareness about definition of BMW .
- Awareness about color code of storage bins and bags.
- Awareness about actions to be taken after exposure to BMW / Needle Stick injury.

2.To study the attitude towards Bio Medical waste management as under:-

- Attitude towards importance of BMW management in the hospital.
- Attitude towards collective responsibility of all staff towards safe BMW management.
- Attitude towards training for safe BMWaste Management.

3. To determine the existing practices regarding the BM waste management in the Hospital as under:-

- Practices that the hospital strictly follows the BMW rules.
- The practice of safe usage of needles and sharps and reporting procedures .
- Practices of immunization against Hepatitis B.

4. To suggest remedial measures(Recommendations) to improve the KAP regarding BMW Management.

CHAPTER 4: METHODOLOGY

Study design - A cross-sectional study using a questionnaire with closed-ended questions. It was distributed to all Doctors/ Dentists, Nurses, Laboratory technicians and Sanitary staff (cleaners and maintenance personnel)

Study area - Cantonment General Hospital Delhi Cantt located at Sadar Bazar.

Study population - Doctors , Nurses , Lab technicians and Sanitary staff in the hospital

Sample Size - 76 HCW involved in healthcare management of the hospital

Sampling method - Random sampling

Data Collection tools and techniques - Structured questionnaire , observation and unstructured interview .

Statistical software to be used - Microsoft excel to analyse the data and create charts and graphs.

Exclusion Criteria -

- Those who were unwilling to be part of the study and those who did not return the questionnaire have been excluded.

Expected Outcome

- Gaps in the level of awareness in the staff about the management of BM waste will be gauged.
- Shortcomings in the attitude and practices of BM waste management in the hospital will be brought out .
- Recommendations for improvement will be given based on the shortcoming which are brought out in the study.

Time Frame - **Feb to May**.

Procedure.

To have an initial understanding about the Bio Medical waste management in the hospital the BMW management procedure was observed for a few days, senior Doctor related with the aspect of waste management was also interviewed through unstructured interview . To gauge the KAP aspects of Bio med waste management a structured questionnaire was prepared based on the literature review , WHO guidelines and the rules in vogue in the country relating to the subject.

A list of HCW available in the four different categories ie Doctors , Nurses , Lab technicians and sanitary staff was obtained from the hospital administration. Random sampling was done to select 25 Doctors , 35 Nurses , 20 sanitary staff and 10 Lab Technicians from the participants. The questionnaire were given to the participants , the contents were explained , their willingness to participate in the study was taken . They were asked to submit the answered questionnaire the next day . From the list of 90 HCW who were given the questionnaire few failed to return the filled up questionnaire, they have also been excluded . **Finally the sample size came to 76 comprising of 21 Doctors , 31 Nurses , 17 Sanitary Staff and 07 Lab Technicians**.

The questionnaire was also pilot-tested on a small group of staff. They were requested to complete it and indicate any questions that they found to be unclear. Confidentiality of all the participants have been maintained.

The resulting answers were graded on a scale (8-10 = Excellent ,5-7 =Good, <5 = Poor) and the percentage of correct and incorrect answers for each question from all the participants have been obtained and tabulated. Charts of important demographical and other results have been prepared with the help of Microsoft Excel. Recommendations have been given based n the gaps / inputs received from the study.

C H A P T E R 5: OBSERVATIONS AND ANALYSIS

Existing Waste management practices

Cantonment General Hospital located in Delhi Cantonment comes under the Delhi Cantonment Board which has got an excellent reputation of being an efficiently administered organisation . The Administration of the Cantonment General hospital is also fully geared up to deliver the best practices to the local population .

The present study noted that there is a proper system for the collection and disposal of biomedical waste in the Hospital. Biomedical waste is generated in various departments, wards and laboratories of the hospital. The surgical ward, emergency facility, Out-patient department, Out-patient department for women , Orthopedic department, Major and Minor OT, Laboratory , Dressing and Injection room, Labor room and Plaster room all generate major quantities of solid waste. At an average daily infectious waste collected is approx 60 Kg out of the Daily total waste generated which is approx 200 kg. The waste which is generated from each department is segregated at source in the departments and put in the 200 odd waste bins which are color coded. The sanitary staff approx 30 in number whose services have been out sourced as part of the House keeping staff are responsible to collect the already segregated waste from the departments and cart the same to respective large waste collection bins/ storage rooms. The collection of these poly bags containing the waste is done daily at 3 pm in the evening . The waste collecting vehicles of the Delhi Municipality Corporation(MCD) collects the general waste in the morning and dumps it in the municipal waste dump (**Figure 5.1**).

Biotic Waste solutions a BMW management company under the Delhi Government is responsible to collects the Bio medical waste from the hospital every alternate day or on call for further treatment and disposal. Biotic Waste Solutions has its own ultra modern treatment facility in Confirmed Industrial Area of Delhi. Highly qualified, experienced and renowned environmentalists manage Biotic Waste Solutions. The facility has installed two incinerators with a capacity of handling 500 kg of bio medical waste per hour as well as other requisite facilities like Autoclave with a capacity of 2100 lts per batch; shredder with a capacity to shred 350kg of waste per hour. To control Pollution,

the company has installed well-designed pollution control systems to meet the prescribed standards (**Figure 5.2**).

General Observations

Other observations based on the visit to the hospital and unstructured interview of the HCWs are as under :-

- The departments were found to be clean and tidy .
- 200 Dustbins were placed at different locations at all the floors in the hospital.
- Various colored poly bags in colored bins were being used as per the rules of BMW management however few bins had same colored poly bags in contravention of the rules.
- There was no spillage of infectious waste outside the dustbins.
- There was no mixing of infected and non infected waste .
- Sharp containers were being used to store the used sharps.
- Sharp containers had Sodium hypochlorite in it.
- Most of the dustbins had lids but few were with broken lids.
- The hospital was using single use needles with needle destroyers and disposable syringes and other items.
- The labor room , Minor and Major OT and Lab were found to be neat and tidy .
- The Sanitation staff were being supervised by Four Supervisors who displayed good knowledge about BMW Management.
- The Sanitary Staff had average to poor knowledge about the BMW.
- The HCW were found to be using protective clothing like gloves , apron , masks and gum boots while handling the BMW.
- Waste bags were not marked as per specifications and some bags were over loaded.
- SOPs and check lists for BMW Management were of old vintage and need to be reviewed and updated.
- A more detailed record of waste disposal needs to be maintained .

Waste flow and disposal as practiced in Cantonment General Hospital

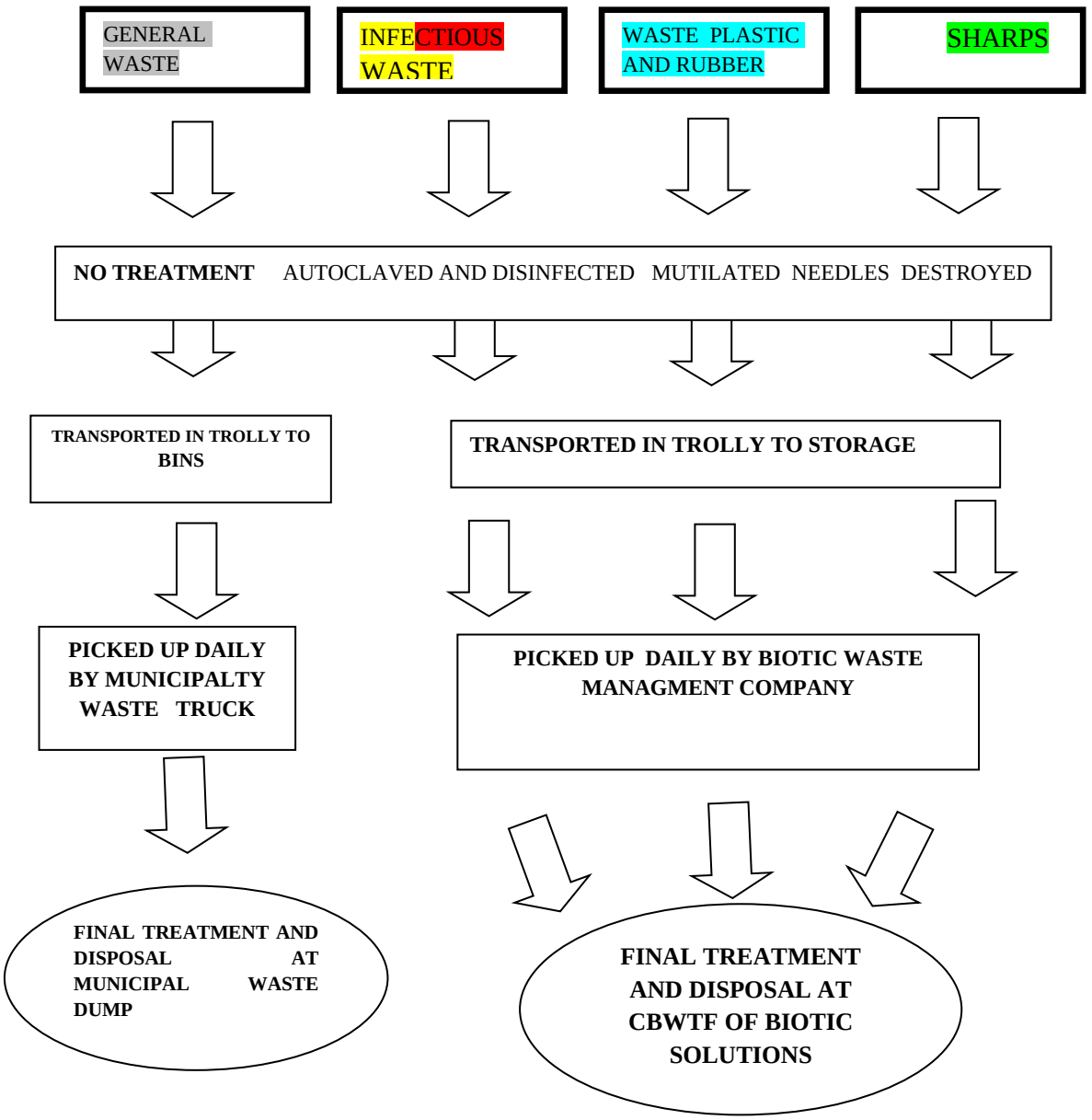

Figure 5.1 : Waste flow chart of CGH

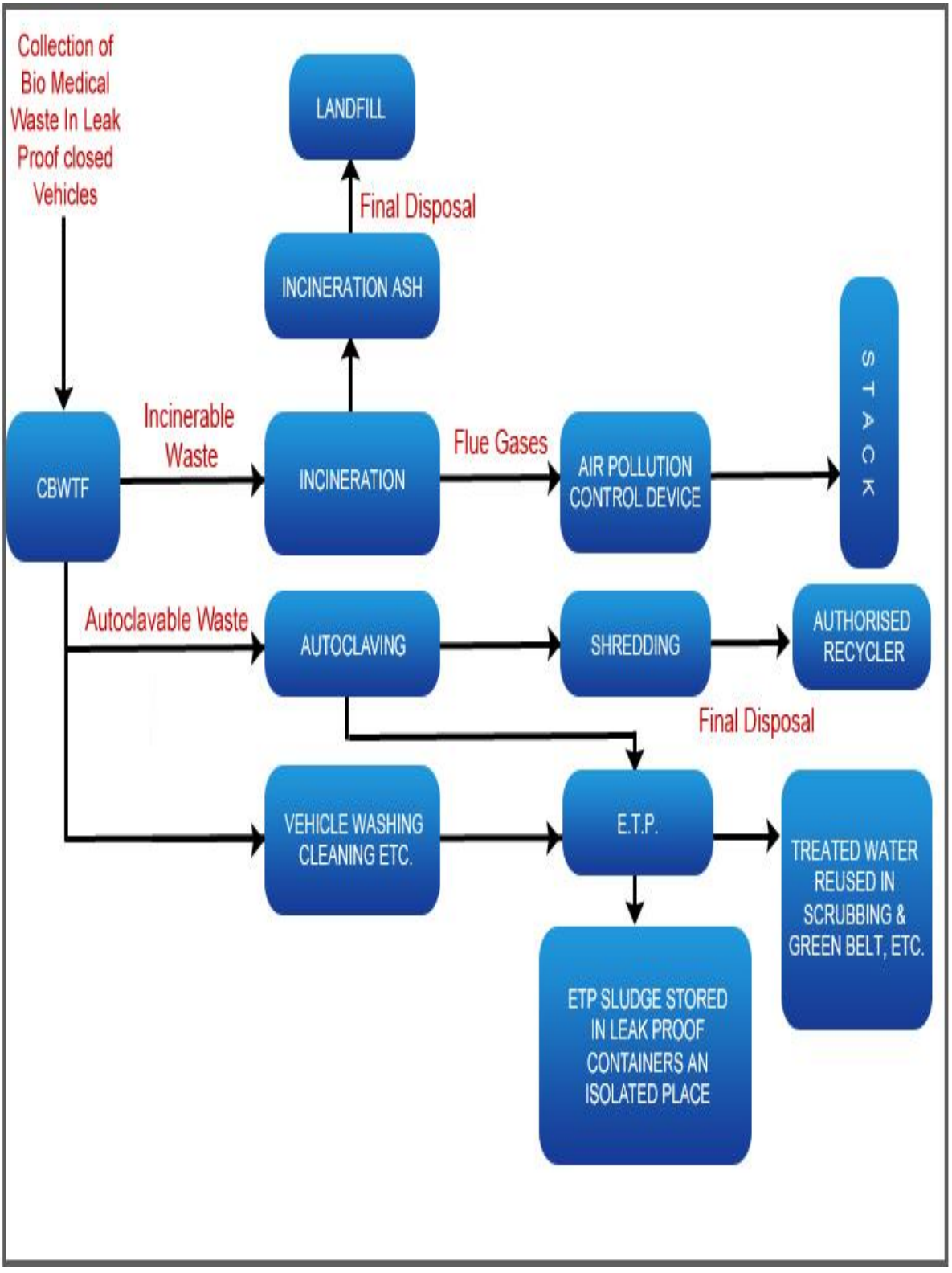

Figure 5.2 : Disposal of waste at CBWTF of Biotic Solutions

Table 5.1 : Knowledge level of HCW in CGH about BMW Management

Standard ---------- Profession	Excellent (8- 10) n (%)	Good (5-7) n (%)	Poor (<5) n (%)
Doctors (N=21)	14 (67%)	07 (33%)	00
Nurses (N= 31)	14(45%)	16(52%)	01 (3%)
Lab Technicians (N=7)	04(57%)	03 (43%)	00
Hygiene Staff (N=17)	**07(40%)**	10(60%)	00
Total (N=76)	**39(51%)**	**36(42%)**	**01(1%)**

The overall Knowledge of HCWs in Cantonment General Hospital , Delhi Cantt regarding BMW Management was high with Doctors scoring the highest at 67% followed by Lab Technicians at 65% and Nurses 45% and lowest was Sanitary Staff at 40%

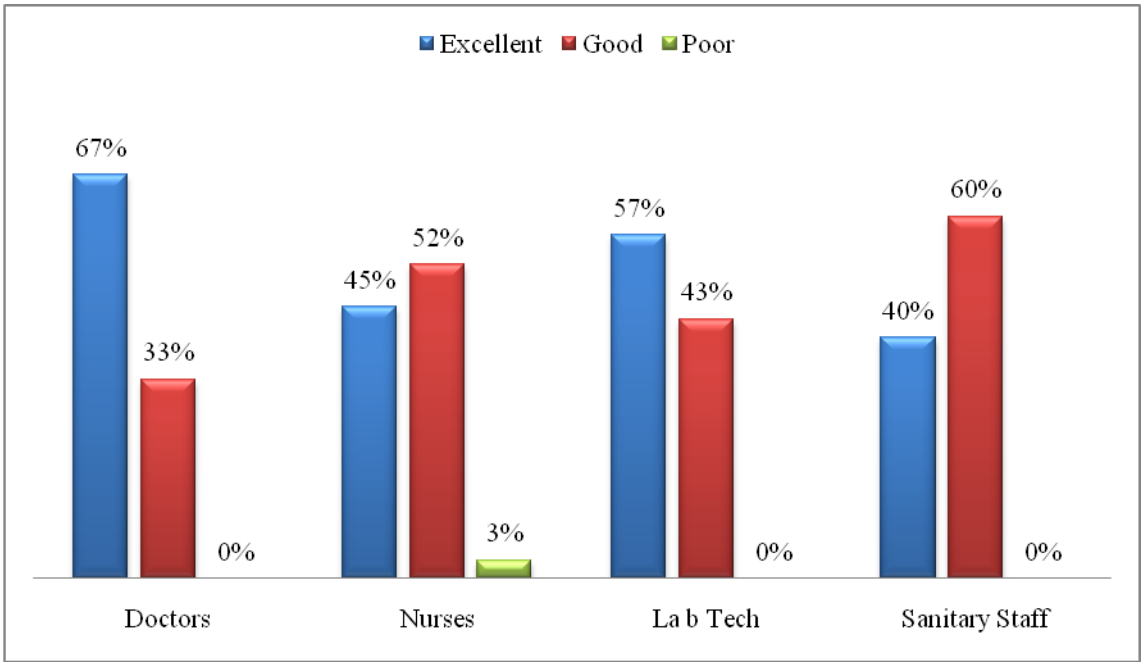

Fig 5.3 Knowledge level of HCW

Table 5. 2: Knowledge level of HCW on BM Waste Management (Question wise data)

		Doctors N=21	Nurses N=31	Lab technicians N=07	Sanitary staf N=17	Total N=76
1	Were aware regarding when the Bio medical waste management rules were proposed	19 (90.5%)	28(90.%)	05 (71%)	11 (65%)	63(83%)
2	Were aware regarding definition of Bio medical waste	21(100%)	25(81%)	06 (86%)	12 (70%)	64(84%)
3	Knew that waste should not be stored beyond 48 hrs	15(71%)	18 (58%)	04 (57%)	08 (47%)	45(59%)
4	Were aware about the regulating body which is responsible for transportation of Bio medical waste	19 (90.3%)	27 (90%)	06 (86%)	10 (53%)	62(81%)
5	Were aware about the colour code used in BM Waste disposal	21 (100%)	31(100%)	07 (100%)	10 (53%)	69(91%)
6	Were aware about the colour code of Bio medical waste to be disinfected and Autoclaved before disposal	18 (86%)	28 (90%)	06 (86%)	08 (47%)	60(79%)
7	Were aware about the portion of infectious waste as a percentage of total waste	18(86%)	10 (32%)	04 (57%)	09 (52%)	47(54%)
8	Were aware about the colour code of bags used for disposal of normal waste	20 (95%)	29 (93.5%)	05 (71%)	09 (52%)	63(83.5%
9	Knew about the action to be taken after exposure to infected waste	16 (76%)	26 (84%)	04 (57%)	06 (35%)	52(68%)
10	Said they were aware of the dangers of NS injury	21 (100%)	21 (68.%)	06 (86%)	10 (58%)	58 (76%)

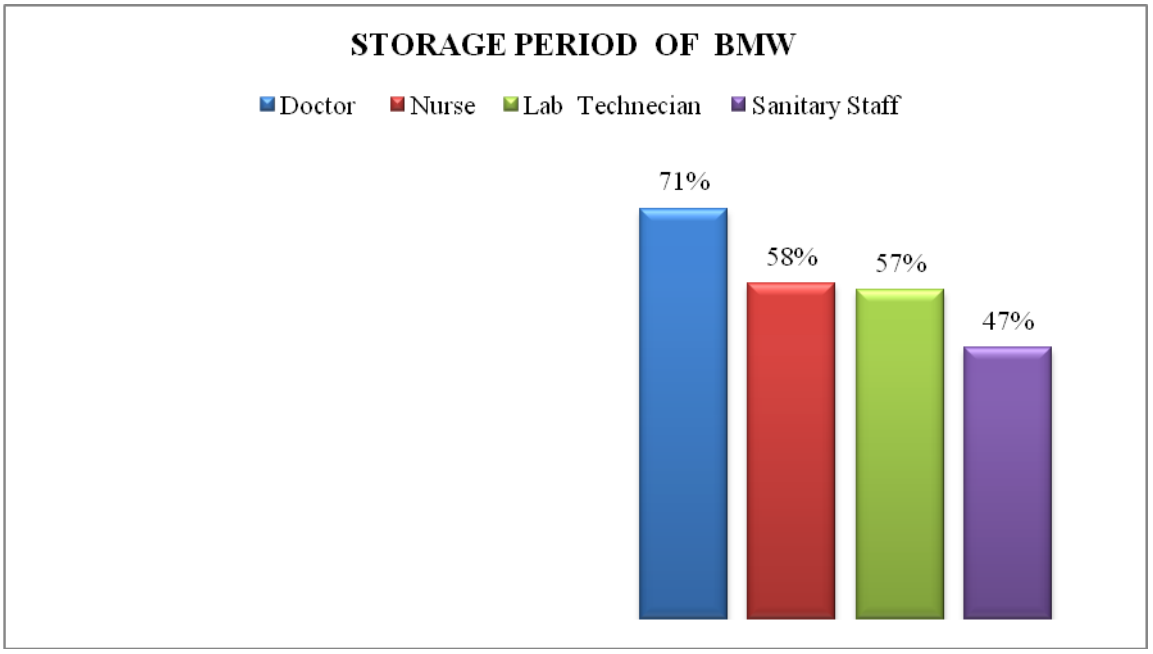

Fig 5.4 : Awareness regarding storage period of BMW

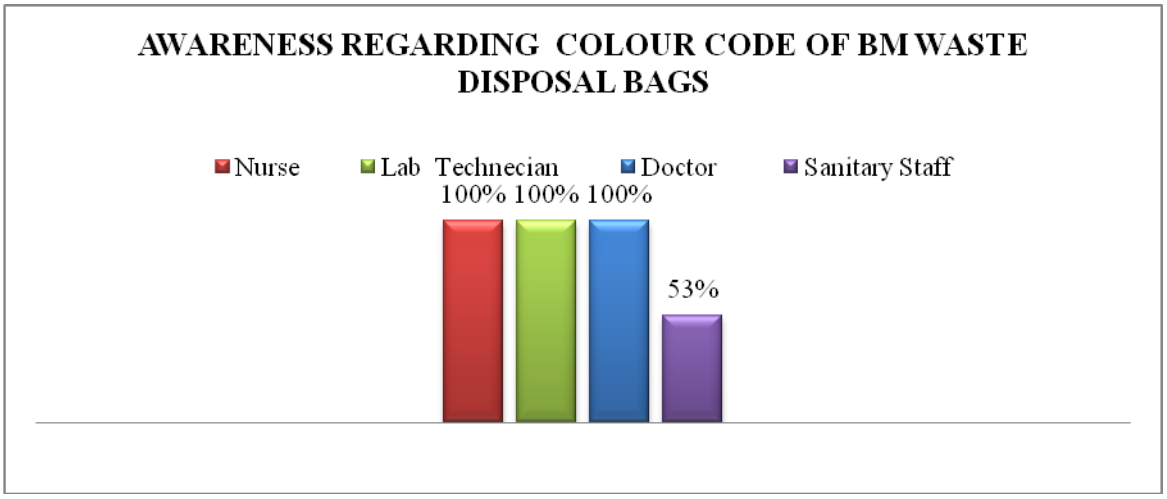

Fig 5.5: Awareness level about color codes of bags for BMW disposal

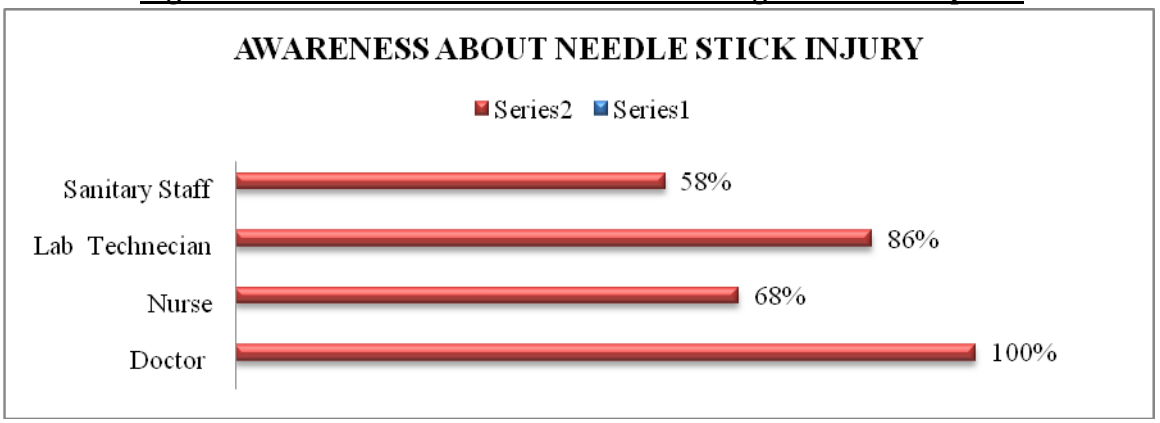

Fig 5.6 : Awareness level of HCW about Needle Stick injury

Analysis of Knowledge related Aspects

As per the inputs of the questionnaire answered by the HKWs , the overall Knowledge of HCWs in Cantonment General Hospital , Delhi Cantt regarding BMW Management was high with Doctors scoring the highest at 67% followed by Lab Technicians at 65% and Nurses 45% and lowest was Sanitary Staff at 40% (**Table 5.1**) Based on the general observation and unstructured interview of the HCWs it was found to be corroborating these figures . The question wise analyses of the survey results is given as under :-

- 90% of the Doctors and Nurses were aware about the BMW rules but there awareness was related to aspects asked in the questionnaire, on ground knowledge on various aspects was lower . It was relatively less in the Lab Technicians and even lower in sanitary staff at65% . The over all awareness about PCBI being the regulatory body dealing with BMW was at 88%.
- The awareness about what constitutes BMW was high in all , while the Doctors had 100% score ,Nurses had 81%, 86 % in Lab Technicians and 67% in Sanitation staff .
- The awareness that, BMW cannot be stored beyond 48 hrs was low , the Doctors were highest at71% , Nurses at 58% , Lab Tech at 57% and lowest in Sanitary Staff at 47% (**Fig 5.4**).
- The knowledge of Doctors , Nurses and Lab Tech about the color coding system for BMW disposal was high (100%) as per the inputs of questionnaire, however it was lower in Sanitary staff at 53%(**Fig 5.5**) . It was also seen that the awareness of the sanitary staff about the color code of BMW that needs to be disinfected before disposal was low at 47%. The awareness level of the Sanitary Staff was also found wanting in the awareness about color code of bags for disposal of general waste , it was at 52%.
- 76% of the Doctors and 84% of the Nurses were aware about the actions to be taken after exposure to BMW , it was low at 57% for the Lab Technicians and still lower at 35% for the Sanitary staff.
- The most important knowledge aspect which was found to be lacking in the HKW was awareness of the dangers of needle stick injury. As per the inputs of questionnaire while the doctors scored a 100 % , Lab Technicians 86% **, the**

Nurses reached a level of only 68% and the Sanitary Staff were low at 58%

(Fig 5.6) On ground implementation and practice is low.

Table 5.3 : Attitude of HCW in CGH about BMW Management

Standard ---------- **Profession**	**Excellent (8-10)** **n (%)**	**Good (5-7)** **n (%)**	**Poor (<5)** **n (%)**
Doctors (N= 21)	12 (57%)	09 (43%)	00
Nurses (N=31)	16(51%)	15(49%)	00
Lab Technicians (N=07)	04(57%)	03 (43%)	00
Hygiene Staff (N=17)	07(41%)	07(41%)	03(17%)
Total	**40(53%)**	**35(46%)**	**01(1%)**

The HCW showed a positive attitude towards BMW management in the hospital, 53% showed an excellent score and 46 % secured a good score (**Table 5.3 and Fig5.7**) . This reflects in the general upkeep , maintenance and cleanliness of the hospital which was of high standard.

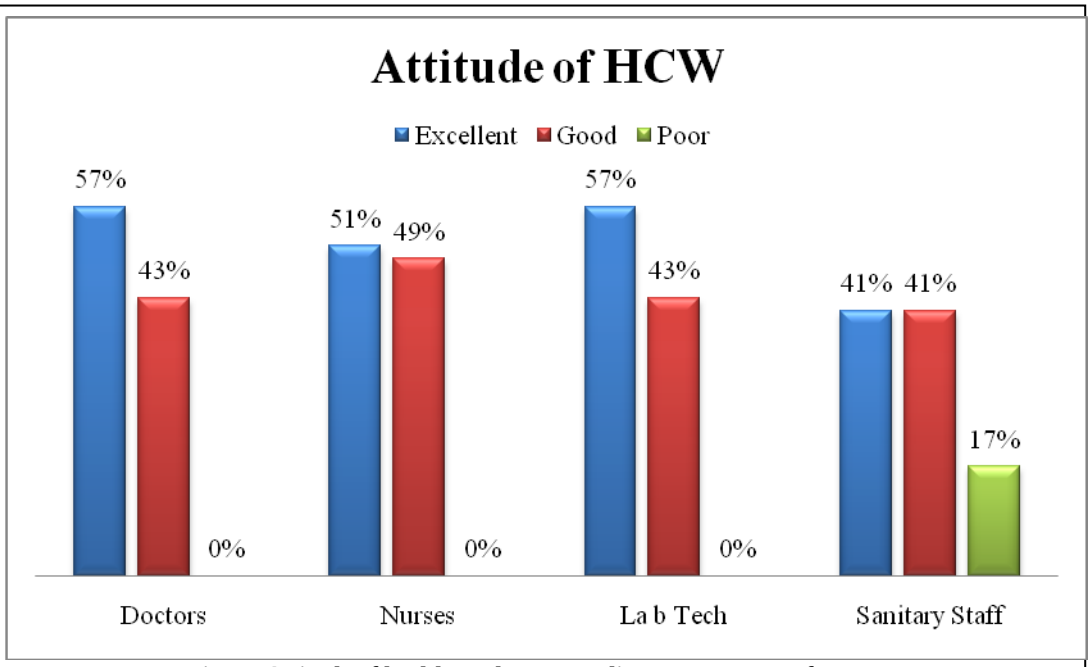

Fig5.7: Attitude of health workers regarding management of BMW

Table 5.4 : Attitude of HCW in CGH about BM Waste Management (Question wise data)

		Doctors N=21	Nurses N=31	Lab technicians N=07	Sanitary staff N=17	Total N=76
11.	That safe management of biomedical waste is an important issue	21(100%)	29(93%)	5 (71%)	15 (88%)	70 (92%)
12.	Bio medical waste management is the collective responsibility of all	21 (100%)	28(90%)	07 (100%)	17 (100%)	72 (95%)
13.	Safe waste management increases the financial burden on the hospital	04(20%)	04(13%)	07 (100%)	12(70%)	27 (48%)
14.	Safe Bio medical waste management is an extra burden on the work	05 (23%)	10(32%)	06 (19%)	04 (24%)	25(33%)
15.	Agree that hospital should organise additional classes on waste management	21(100%)	31(100%)	07 (100%)	17 (100%)	76 (100%)
16.	Will voluntarily attend programmes to upgrade their knowledge on waste management in the hospital	21 (100%)	31 (100%)	07 (100%)	17 (100%)	76 (100%)
17.	Agree that infectious waste should be sterilised before shredding and disposal	17(80%)	05(16%)	06 (86%)	08 (47%)	32 (42%)
18.	Think that an effluent treatment plant should be set up in the hospital	10 (48%)	05(16%)	01 (14.2%)	05 (29%)	21 (28.%)
19.	Feel it is important to report about an institution to pollution control board if it is not complying to the guidelines	21 (100%)	31 (100%)	07 (100%)	17 (100%)	76 (100%)
20	Think that labeling the container before filling is important	20 (95%)	30 (97%)	07 (100%)	16(94%)	73 (96%)

Analysis of Attitude Related Aspects

The HCW showed a positive attitude towards BMW management in the hospital, 53% showed an excellent score and 46 % secured a good score (**Table 5.3**) . This reflects in the general upkeep , maintenance and cleanliness of the hospital which was of high standard. The question wise analysis of the aspects is as under (**Table 5.4**) :-

- 92% of the participant HCW agreed that BMW management was an important issue , 95 % said that it was a collective responsibility . Only 48% felt that it increased the financial burden of the hospital and only 33% felt that it increased the burden of work . This reflects the changing attitude of the HCW about BMW management in the present scenario .This aspect was also corroborated by observations on ground and unstructured interview of the HCW
- **The HCW were unanimous about their view that the hospital should conduct regular training and awareness modules about BMW management and all (100%) were volunteers to attend any such training programs. It was also brought out in the unstructured interview that regular training was not in vogue.**
- 76% of the HCW felt that it was important to comply with the directions of pollution control board and any non compliance must be reported , this reflects an eagerness for the protection of the environment as also respect for the rules.
- Only 42% of the HCW felt that infectious waste should be sterilized before disposal , lowest being the Sanitary staff . As the Sanitary staff had minimal role to play in the sterilization of BMW ,possibly their view is an off shoot of their lack of knowledge in this aspect .
- Only 28% felt the necessity of having an Effluent Treatment Plant (ETP) in the hospital , possibly effected by the fact that the disposal of the BMW is out sourced to a company specializing in this service .

Table 5.5 : Practices of HCW in CGH on BMW Management

Standard ---------- Profession	**Excellent n (%)**	**Good n (%)**	**Poor n (%)**
Doctors N=21(28%)	5 (24%)	10 (48%)	06(28%)
Nurses N=31(41%)	16(51%)	10(32%)	05(28%)
Lab Technicians N=07(09%)	06(86%)	01 (14%)	00
Hygiene Staff N=17(22%)	05(29%)	10(59%)	02(12%)
Total - 76	**32(42%)**	**31(41%)**	**13(7%)**

The BMW management practices were found to be low, it was seen that overall the HCW scored only 42% Excellent , 41% Good and 7% Poor scores (**Table 5.5 andFig5.8**) Nurses and Lab Technicians have scored better than the Doctors and the Sanitary Staff .

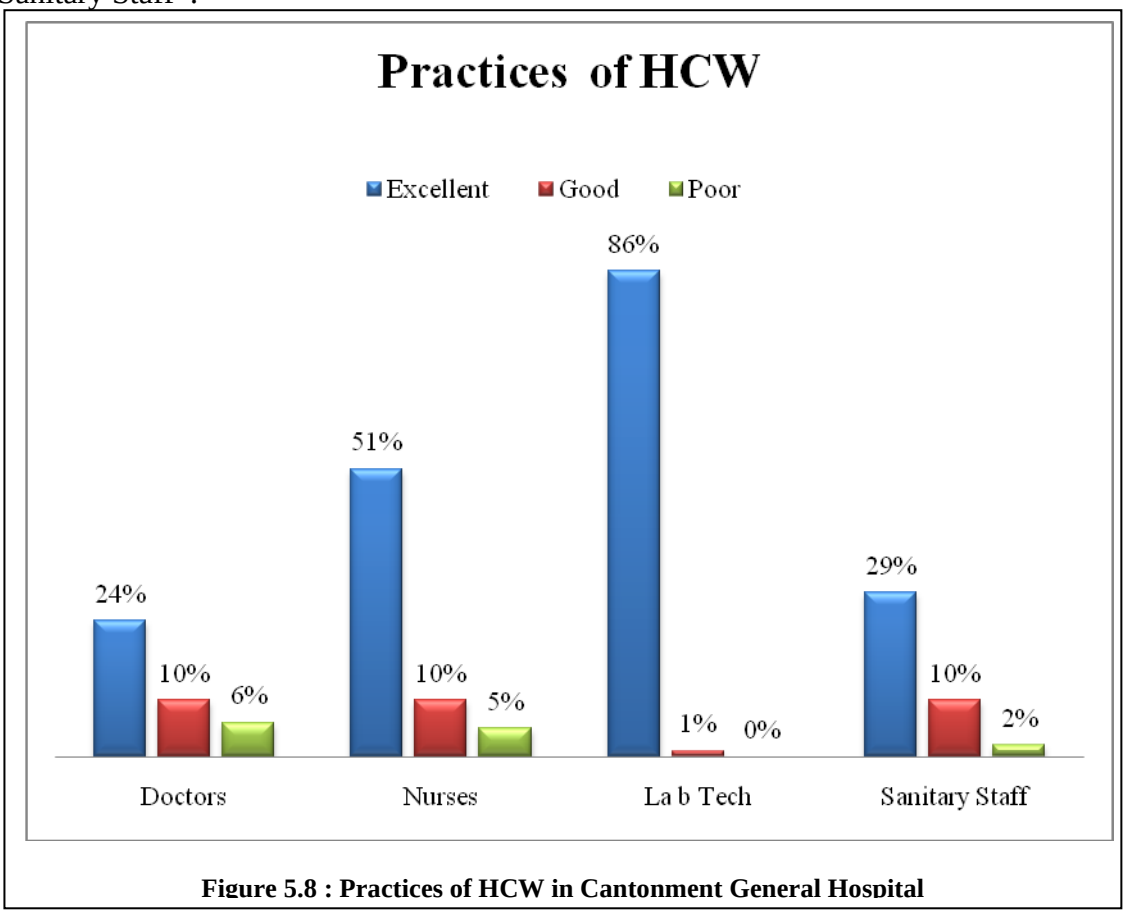

Figure 5.8 : Practices of HCW in Cantonment General Hospital

Table 5.6 Practices of HCW in Cantonment General Hospital

		Doctors N=21	Nurses N=31	Lab Technicians N=07	Sanitary staff N=17	Total N=76
21	Follow strictly the colour coding of BMW	**21 (100%)**	**31 (100%)**	**07 (100%)**	**17(100%)**	**76 (100%)**
22	Feel that the waste disposal practise of the hospital is correct	**21 (100%)**	**31 (100%)**	**07 (100%)**	**17 (100%)**	**76(100%)**
23	Feel that sharps are disposed in sharp containers before final disposal	**17(81%)**	**31(100%)**	**07 (100%)**	**17 (100%)**	**62 (82%)**
24	Feel that adequate/ regular training is being done in the hospital on BM Waste management	**11(52%)**	**11 (35%)**	**11(35%)**	**10(59%)**	**37(49%)**
25	Still practice recapping of used needles	**08 (38%)**	**04(13%)**	**01(14%)**	**03(17%)**	**16(21%)**
26	Discard a used needle immediately	**18 (86%)**	**25 (81%)**	**07 (100%)**	**17 (100%)**	**57 (75%)**
27	Have either sustained needle stick injury since last 12 months or are not clear about it	**02 (10%)**	**05 (16%)**	**02 (28%)**	**04 (23%)**	**13 (17%)**
28	Have reported about the needle stick injury	**00 (00%)**	**00 (00.%)**	**00 (00.%)**	**00 (00.%)**	**00 (00.%)**
29	Have filled an incident report about the needle stick injury	**00 (00%)**	**00 (00%)**	**00 (00%)**	**00 (00%)**	**00 (00%)**
30	Have been fully inoculated against Hepatitis B	**9(43%)**	**05 (16 %)**	**03 (43%)**	**9 (52%)**	**26(34%)**

Analysis of Practice Aspects of BMW Management

The scores in Knowledge and Attitude about the BMW was fairly high with most scores in excellent and good and no poor score but in the field of practices on ground it was seen that overall the HCW scored only 42% Excellent , 41% Good and 7% Poor scores (**Table 5.5**) . Nurses and Lab Technicians have scored better than the Doctors and the Sanitary Staff . **21% 0f the HCW still practice capping of used needle rather than destroying it** immediately and **only 34 % of the HCW have been fully inoculated for Hepatitis B**. The high scores in knowledge aspects as per input of the questionnaire is in varience to the practices on BMW management on ground. Question wise analysis of other parameters are as under (**Table 5.6**):-

- 100 % of the HCW felt that there is a high level of adherence to BMW Management rules including color coding and BMW disposal in the hospital but on ground a number of aspects like use of proper color code bags for BMW storage etc were not being adhered to.
- Only 49 % feel that regular training is being done on BMW Management indicating that more emphasis needs to be given to this important aspect. On ground observation reveals inadequate regular training on ground .
- Overall 75% of the HCW practiced discarding of an used needle where as 25% (14% Doctors , 16% Nurses , 25% Sanitary Staff) still either practiced it or were not clear about it
- Approx 17 % of the HCW said that either they sustained some sort of needle stick injury in the last 12 months or they were not very clear about it but non said that they reported the matter or filled a report about this aspect . Almost 12 % of the HCW were not practicing correct disposal of sharps in sharp containers .

Limitations of study The questionnaire was in English where as the Sanitary staff understood only Hindi hence this could be a limitations of study.

Recommendations

The recommendations based on the general analysis of data and observations during the visits to various departments and the questionnaire, which can go a long way in improving the BMW Management Hospital is as under:-

Primary Recommendations

- All staff handling BMW should be immunized against Hepatitis B
- All HCW need to be put through a proper induction and regular training in which aspects of BMW management related to the hospital should be covered special emphasis to be given to Doctors , Nurses and Sanitary staff who have been found lacking in the practice aspects
- A monthly audit of knowledge and practices of BMW management aspects should be done by the committee detailed for the purpose
- All HCW should be l trained on actions to be taken when exposed to BMW ,Needle stick injury and the documentation related to the same .

General Aspects

- The existing SOPs and check lists related to BMW should be updated
- Records of waste disposal esp BMW should be maintained religiously
- Adequate no of colored poly bags as per the color code of BMW should be provided to the departments and Sanitary staff
- All Bins with broken lids should be replaced
- The outsourced sanitary staff should be briefed and debriefed by the Supervisors daily
- Proper marking of the garbage bags as per Schedule iii and iv should be adhered to.
- More needle destroyers should be issued to injection room and Labs
- Wheeled trolley for transportation of waste bags to be used
- Training on post exposure prophylaxis should be given due importance
- Adequate finances to be catered for BMW management in the budget

CHAPTER 6: DISCUSSION

This cross sectional study identified certain gaps and deficiencies in the KAP of various categories of HCW . Awareness regarding the correct definition of BMW Correct color coding was good among all the other categories of HCWs, except the sanitary staff. Disposal of BMW before 48hrs was known to a majority of respondents but was least among the Sanitary staff when compared with other categories of HCWs.

The knowledge and practices about Needle stick injuries , prevention , reporting and recording was an area of concern in all categories of HCW . **Recapping of used needles was still practiced by 21% of the HCW**. **The sanitary staff were found wanting in most of the aspects of attitude and practices** possibly due to their poor literacy status and poor understanding of various aspects . Out sourcing of BMW disposal is a good idea but the safe disposal of BMW is still the responsibility of the hospital.

Only 34 % of respondents had been fully immunized against hepatitis B , this is a big gap and a finding which needs to be acted upon immediately. The attitude of all HCWs including sanitary staffs toward BMW management was positive and favorable, as only 2.5% of participants felt that BMW management is not an issue and only 7.5% of them felt that safe management of BMW is an extra burden on work. This was in contrast with findings of the study by Radha[20] who found that the attitude of majority of the sanitary staffs was less favorable, a possible difference in the attitude could be as the Sanitary Staff in CGH are outsourced , hence a more professional approach .

Majority of all categories of HCWs have agreed to the **need of regular training on BMW aspects** and are willing to attend the same. **Present training given is not adequate** thus a need for more emphasis on the regular training of Doctors ,Nurses and Sanitary staff on various BMW aspects .

The practice aspect was comparatively low in all HCW as given in other studies. Most of the identified gaps could be addressed by structured training ,regular audit by the authorities and ensuring strict compliance from all HCW .

Overall, the cleanliness , maintenance ,knowledge and attitude about BMW management among HCWs in the CGH were found to be much better than those reported by other studies done on HCWs in other Government hospitals . This could be attributed to strict instructions by the Cantonment board authorities, efforts of Hospital Administrators at CGH and a positive attitude of the HCW

CHAPTER 7: CONCLUSION

It can be concluded from the present study that while overall there is good level of Knowledge, high level of positive attitude about BMW generation hazards, legislation and management among health care personnel in Cantonment General Hospital , Delhi Cantt , the aspects of practices are certainly lacking owing to inconsistent training on the practical aspects and poor compliance audit , which is required to be done regularly

Literature review suggests that this is a common problem in many other health care institutions in both India and other countries. The importance required to be given to BMW management is just picking up in India as Hospitals have realised that proper BMW management is good business sense as it helps them to reduce Hospital related infections increased popularity of the hospital and increases revenue too.

It is imperative that waste should be segregated and disposed of in a safe manner to not only protect the environment but also the health of patients and HCW alike. Regular monitoring and training of the HCW is required at all levels, we have to remain alive to the issue at all levels only then will the situation improve and the hospitals will become a better and safer place for both the patient and the Health Care workers.

REFERENCES

1. Document, http://www.cbdelhi.in/Documents/ca2006.pd

2. http://www.census2011.co.in/census/city/62-delhi-cantonment.html

3. THE CANTONMENTS ACT, 2006 # NO. 41 OF 2006 [13th September, 2006.]

4. www.wikepedia .org

5. ww.cbdelhi.in

6. Government of India, Ministry of Environment and Forests. Bio-Medical Waste (Management and Handling) Rules. *Gazette of India*. 1998 (27 Jul). Available from: http://envfor.nic.in/legis/hsm/biomed.html

7. World Health Organization (WHO). Safe Management
of Bio-Medical Sharps Waste in India: A Report on Alternative

8. Government of India, Ministry of Health and Family Welfare (MoHFW). National Guidelines on Hospital Waste Management Based upon the Bio-Medical Waste (Management and Handling) Rules, 1998. New Delhi: MoHFW; 2002.

9. Bio - medical waste management self learning document for Nurses and paramedical by EPTRI (www.eptri.com)

10. Waseem Q, Hassan G, Wani NA, Baba A, Kadri S M, Khan Nazir M S, Awareness of bio medical waste management amongst staffs of government SHMS Hospital Srinagar,J K Practitioner,2007; 14(1);60-61

11. Jahnavi G, Raju P V, Awareness and training need of biomedical waste management among undergraduate students Andhra Pradesh, Indian Journal of Public Health;2006 January- March.50(1) 53-54

12. Kishore J, Goel P, Sagar P, Joshy T K, Awareness about biomedical waste management and infection control among dentists of a teaching hospital New Delhi, India, Indian Journal of Dental research,2000 October- December11(4)157-161

13. Sing R, Kishore J, G Mathur, Mandal K, Puri S, The role of informational booklet on biomedical waste management for nurses, Nursing Journal of India, 2002,August; 271-272.

14. Hegde V, Kulkarni RD,Ajantha S, Bio medical waste management.,Journal of oral maxillofacial pathology ,2007,volume 11,Issue 1,5-9.

15. Rasheed S, Iqbal S, Baig L A, Mufti K,Hospital Waste management in teaching hospital Karachi, Journal of Pakistan Medical Association,2005,55:192

16. Sharma S , Chauhan S V, Assessment of biomedical waste management in three apex government hospitals of Agra, Journal of Environmental Biology, 2008, March,29(2);159-162

7. Massrouje H T, Medical waste and health workers in GAZA Governorates, East Mediterranean Health Journal,2001, November; 7(6);1017-1024

18. Rao P, H, Hospital waste management Awareness and practices a study of three states of India, Waste management research, 2008, June;26(3);297-303

19. Mostafa GMA et al (2007) protocol based on knowledge and practice of health personnel in surgical Departments, Waste management, 2008,Volume 29,430-439

20. Pandit N B, Mehta HK, Karth G P, Chaudhary S K, Management of biomedical waste Awareness and practices in a district of Gujarat, Indian Journal of Public health, 2005.October- December;49(4)245-247

21. Saini S, Nagarajan SS, Sarma R K, Knowledge attitude and practices of biomedical waste management amongst staffs of a tertiary level hospital in India, Journal of the Academy of Hospital administration, 2005,vol 17,No2,1-12

22 . Radha et all Knowledge; Attitude and Practices of Bio-Medical Waste Management Amongst Staff of a Tertiary Level Hospital in India. J Acad Hosp Adm2005;17:2.

APPENDICES

Appendix 1

Assessment of Biomedical Waste in Cantt Board Hospital Delhi Cantonment

Form NO ( )

Instructions - Please mark the correct option (+)

Profession - Doctor/Dentist ( ) Nurse ( ) Lab technician ( ) Class IV employee ( )

Section 1: Knowledge of biomedical (BM) waste generation, hazards, legislation and practices

1. Biomedical Waste (Management & Handling) Rules were first proposed in:
   1997 ( ) 1998 ( ) 1999( ) 2000( )

2. Which statement describes one type of BM waste:
   ( ) Materials that may be poisonous, toxic, or flammable and do not pose disease-related risk.
   ( ) Waste that is saturated to the point of dripping with blood or body fluids contaminated with blood.
   ( ) Waste that does not pose a disease-related risk.

3. According to the Biomedical Waste (Management & Handling) Rules, waste should not be stored beyond:
   12 hours ( ) 48 hours ( ) 72 hours ( ) 96 hours( )

4. Who regulates the safe transport of medical waste?
   Pollution Control Board of India.( )
   Transport Corporation of India.( )
   College Administration.( )

5. Do you know about colour-coding segregation of BM waste?
   Yes ( ) No ( ) Not sure ( )

6. The colour code for the BM waste to be autoclaved, disinfected is:
   ( ) Red ( ) Black ( ) Yellow ( ) Blue/white

7. The approximate proportion of infectious waste among total waste generated from a health care facility is:
   ( ) 10-20% ( ) 30-40% ( ) 50-60% ( ) 80-90%

8. The colour code for disposal of normal waste from the hospital is:
   ( ) Red ( ) Black ( ) Yellow ( ) Blue

9. All the following steps should be followed after an exposure with infected blood/body fluid and contaminated sharps EXCEPT:
   ( ) Exposed parts to be washed with soap and water.
   ( ) Pricked finger should be kept in antiseptic lotion.
   ( ) Splashes to eyes should be irrigated with sterile irrigants.

( ) Splashes to skin to be flushed with water.

10. Are you aware about the dangers of needle stick injury

Yes ( ) No ( ) Not sure ( )

Section 2: Attitude/behavior assessment towards biomedical waste

11. Safe management of health care waste is not an issue at all.

Agree ( ) Disagree ( ) Cannot comment ( )

12. Waste management is team work/no single class of people is responsible for safe management.

Agree ( ) Disagree ( ) Cannot comment ( )

13. Safe management efforts by the hospital increase the financial burden on management.

Agree ( ) Disagree ( ) Cannot comment ( )

14. Safe management of health care waste is an extra burden on work.

Agree ( ) Disagree ( ) Cannot comment ( )

15. Do you think that the hospital should organise separate classes or a continuing education pro-gramme to upgrade existing knowledge about biomedical waste management?

Yes ( ) No ( ) Cannot comment ( )

16. Will you like to attend voluntarily programmes' that enhance and upgrade your knowledge about waste management?

Yes ( ) No ( ) Cannot comment ( )

17. Do you think that infectious waste should be sterilized from infections by autoclaving before shredding and disposal?

Yes ( ) No ( ) Cannot comment ( )

18. Do you think that an effluent treatment plant for disinfection of infected water should be set up in hospital?

Yes ( ) No ( ) Cannot comment ( )

19. Do you think it is important to report to the Pollution Control Board of India about a particular institu- tion if it is not complying with the guidelines for biomedical waste management?

Yes ( ) No ( ) Cannot comment ( )

20.Do you think that labelling the container before filling it with waste is of any clinical significance?

Yes ( ) No ( ) Cannot comment ( )

Section 3: Level of Practices among nurses, doctors, attendants, lab technicians on Bio medical waste management

21. Do you follow colour-coding for BM waste?

Yes ( ) No ( ) Sometimes ( )

22. Is the waste disposal practice correct in your hospital?
Yes ( ) No ( ) Cannot comment ( )

23. Objects that may be capable of causing punctures or cuts, that may have been exposed to blood or body fluids including scalpels, needles, glass ampoules, test tubes and slides, are considered biomedical waste. How should these objects be disposed of?
( ) Black bags ( ) Yellow bags ( ) Clear bags ( ) Sharps container

24. Are regular training being done on disposal of BM waste
Yes ( ) No ( ) Do not remember ( )

25. Do you re-cap the used needle?
Yes ( ) No ( ) Do not bother ( )

26. Do you discard the used needle immediately?
Yes ( ) No ( ) Have not noticed ( )

27. Have you sustained a needle-stick injury during the last 12 months?
Yes ( ) No ( ) Do not remember ( )

28. Did you report the needle-stick injury?
Yes ( ) No ( ) Do not remember ( )

29. Did you fill in an incident report?
Yes ( ) No ( ) Cannot remember ( )

30. Have you been fully inoculated against hepatitis B?
Yes ( ) No ( ) Not sure ( )

Thank you for your valuable time and cooperation.
Col Pradeep Choubey

Parameters

Excellent: 8 - 10
Good to average: 5-7 correct answers out of 10
Poor: <5 correct answers out of 10

Health care personnel	**Scoring(%) Criteria**		
	Excellent	**Good to average**	**Poor**
Doctors			
Nurses			
Lab technicians			
Sanitary staff			

-