Lt. Col. Shyam Singh D Report

by Lt.col. Shyam Singh

Submission date: 06-Jun-2019 09:27AM (UTC+0530)
Submission ID: 1140528526
File name: PROJECT_BMW_BY_ROLL_NO_63_FINAL_FOR_PLAGARISM_CHECK.docx (404.09K)
Word count: 8330
Character count: 42490

Introduction.

We all know that any person, who is sick and injured and brought to the hospital, is given the best available medical care. However, during the course of the treatment of patient, biomedical waste is also generated at the hospital premise and hence needs to be given due priority. If healthcare providers does not handle BMW properly as per norm , either knowingly or unknowingly, it would result in many health complications not only to humans but everyone in the ecosystem. The safe segregation, transportation and disposal of BMW is a cause of concern as error/ not following guidelines will result in untoward health and environment hazard.

All waste generated in hospital setting due to treatment of human beings / animals, especially any body parts/ blood / body fluids/ soiled linens/ cotton bandages etc from infected patient or zone in the hospitals must be collected properly and then separated , stored, transported, and thereafter treated and disposed off in a secured manner to avoid or minimise infection acquired at hospital.

Definition of Biomedical waste

Any waste that is produced during treatment , diagnosis or inoculation of humans or animals or as a result of research activities thereto or in the production/ testing of biological and including categories mentioned in the schedule 1 of biomedical waste rules 2016 by Ministry of environment & forest notification.

Classification of Hospital waste

All waste generated in the hospital premise is hospital waste. It includes every type of waste i.e. general, biomedical, radiological, hazardous waste etc. General waste is non hazardous and it includes waste generated in kitchen, all form of packing materials, paper and plastic. This type of waste is discarded as per municipal waste management rules of the locality.

Biomedical waste includes pathological, infectious, sharps, pharmaceutical waste. The summary of same is as under:-

a. Pathological waste such as human foetus, blood and body parts like tissues, organ, etc.
b. Pharmaceutical waste like drugs and chemicals which has been returned from wards, due to contamination / expiry.
c. Infectious waste in good concentration caused by pathogens.
d. Sharps to include scalpels, blades, needles etc.

The BMW Rules 2016 rules are not applicable in under mentioned case:-

(a) Radioactive wastes generated in HCF.

(b) Hazardous chemicals notified under Rules of the year 1989.

(c) All solid waste covered under municipal solid waste, Rules of 2000.

(d) Lead acid batteries.

(e) Hazardous waste which falls under the category of Hazardous Wastes Rules, 2008.

(f) e-Waste.

(g) Dangerous micro organisms.

It must be noted that BMW must be managed through a combined integrated effort of all stakeholders which will address the generation, separation, collection, processing, movement, storage, treatment cum removal of waste.

Segregation of Biomedical waste

All the four categories of BMW must be properly segregated in required container or bags. No anatomical BMW will be kept or stored in HCF premise beyond more than 48 hours. All container used to store waste has to be sturdy and designed in such manner that it contains maximum volume and weight without any damage to container. It must also be puncture or leakage proof.

Segregation of waste at the source not only helps to minimise amount of waste to be treated but also helps in more efficient treatment of the four categories of BMW. Colour coded liners which are placed in the bins helps in easy segregation. The various colour bags used in BMW management are tabulated under Table 2.

Table 2: Waste disposal in different Colour coded bags

Type	Category	Bag /container Used	Disposal/ treatment method
Yellow	**Human** Anatomical Waste	Yellow plastic bag (non- chlorinated)	Incineration / Plasma Pyrolysis /deep burial
	Animal Anatomical Waste		
	Soiled Waste		By Incineration/ Plasma pyrolysis/deep burial. If above facility are not available then, autoclaving/ micro-waving/ hydroclaving followed by shredding or combination of sterilization & shredding.

			Treated waste to be forwarded for energy recovery.
	Expired or **Discarded Medicines**	Yellow plastic bag (non- chlorinated)	Expired Cytotoxic drugs to be returned to supplier for incineration or to CBWTF
	Chemical Solid Waste		Incineration / Plasma pyrolysis
	Chemical Liquid Waste	Separate collection system leading to effluent treatment system	Chemical liquid waste must be pre-treated before mixing with waste water.
	Discarded linen, mattresses, beddings infected with blood.	Nonchlorinated yellow plastic bags	Nonchlorinated chemical disinfection and then by incineration/plasma pyrolysis.
	Microbiology, **Biotechnology** and other **clinical laboratory** waste	Autoclave	On site-pre-treatment
Red	**Contaminated Waste**	Red plastic bag (non- chlorinated)	Autoclaving/micro-waving/ & shredding or combination of sterilization and shredding.

			Treated waste to be sent to authorize vendor who does recycling / energy recovery etc
White (Translucent)	Waste sharps which also includes metal waste	Puncture, tamper and leak proof containers	Autoclaving / sterilization and then shredding /encapsulation and subsequently disposed to iron foundries
Blue	**Glassware**	Blue colour card board boxes	Disinfection/ autoclaving/ microwaving/ hydroclaving and subsequently recycled
	Metallic Body Implants		

Label for Biomedical Waste:

Label should be displayed conspicuously and it should be not get effected by wash. All polythene bags used must have a biohazard symbol inscribed. Similarly, the BMW store room must also have biohazard symbol prominently displayed to caution everyone. Only authorize person working at biomedical room is allowed entry with PPE worn at all times.

Biohazard Symbol

Cytotoxic Symbol

Abstract

A cross sectional study aimed to check awareness amongst the nursing and housekeeping staff of Venketeshwar hospital, Dwarka, New Delhi on BMW handling. The project was conducted over a period of one and half month. The research study used **convenient** sampling as the sampling method and collected primary data through quantitative structured questionnaire as well as by qualitative method i.e. through observation. A total of 110 i.e. 50 nurses and 60 housekeeping staff participated in the study. The quantitative study was based on response to survey questionnaire given to the study population. In addition to few common questions, questions to nurses were different than for housekeeping staff in view of different educational levels. The analysis of the data concluded that both nurses and housekeeping staff at Venketeshwar Hospital possesses a good knowledge on handling and management of biomedical waste. Both these two category of staff has a good knowledge of their work related to BMW management.

Rationale of the study.

The healthcare in India is growing day by day into fastest growing sectors. Although, the healthcare facilities are a basic requirement for human but these also contain life threatening wastes and toxins. All healthcare / hospital generate a lot of waste during identification, treatment/ vaccinations of humans and/ or animals in its premises. Out of the total waste generated within HCF, approximately 10 to 15 % of the waste generated is infected and hazardous. However, if infected waste is not separated properly at the point of generation of waste and allowed to mix with non hazardous waste, then everything is to be treated as hazardous. In our country, all BMW generated within HCF has to be regulated disposed of as per Central Government, gazette notification on BMW rules 2016 which was subsequently amended in the year 2018.

Any waste produced in the course of treatment/ vaccination of human being or animals or in the production or testing of biological is called biomedical waste. It is categorized into general, infected, sharps and pharmaceutical waste.

In India, on an average approximately 0.3 and 2.0 kg/bed/day of waste is generated in HCFs and annually the waste generated is 0.32 million tons.. The improper handling of the waste produced by the hospitals may pose even greater risk to the ecosystem than by the original cause of diseases.

Nursing staff and housekeeping staff who handles the biomedical waste are usually at more prone to infections like HIV, Hepatitis B and other sharp injuries etc. In India annual injury rates among nurses and housekeepers is 10-20 per 1000 workers.

In the year 1992, 2 cases out of 8 reported HIV infection related to occupational infection, occurred due to transmission of infection from wounds in waste handlers, in France.

In June 1994, the centres for disease control and prevention of USA, confirmed 39 cases of HIV infection to occupational infections of HC professionals dealing with hospital waste.

Therefore, rationales for the study on Biomedical waste management are:-

- Chances of hospital acquired Infection to patient due to inefficient and inadequate infection control and waste management including biomedical waste.
- Greater risk to diseases amongst HCF handlers specially those who deals with hospital waste.
- Risk of spread of infection to public.
- Environmental risk like air/water/soil pollution associated with poor disposal of waste including BMW.
- Unscrupulous practises by few vendors by compromising on disposable drugs i.e repacking and selling to unsuspecting buyers.

REVIEW OF LITERATURE

To obtain secondary source information on the subject and develop the project in structured manner, review of literature was necessary as it helped in obtaining relevant information on the subject. It helped in knowing what all has been done on the subject. It assisted in making a basic structure of the research methodology.

For this project, secondary review of literature was carried out under following sub headings:-

a. Studies from existing government regulations.

b. Studies on awareness of biomedical waste.

STUDIES FROM EXISTING GOVERNMENT REGULATIONS

Biomedical Waste (Management and Handling) Rules, 2016.

In June 2016, the Ministry of Environment, Forest and Climate change, Government of India by gazette notification enacted BMW Rules, 2016 by reviewing the existing rules of BMW. The aim was to make BMW rules more effective and improve the collection and segregation, bio-medical wastes at the source of generation. The rule is applicable to all individual who generates, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form. It enlarged it ambit by adding various health / medical / surgical/ vaccination as well as blood donation camps, first aid rooms of various schools, forensic and research labs. Under the BMW rules of 2016, category of waste was reduced from ten to just four only. All occupier of HCF had to sign an agreement with CBMTF located within 75 KM radius and were not permitted to dispose the BMW on their own its premise. This rule also allowed pre

treatment of lab and blood bank wastes. The government also simplified the procedure of obtaining authorisation.

Bio-Medical Waste Management (Amendment) Rules, 2018.

On 16 March 2018, GoI vide special gazette notification published the BMW rules (Amendment) 2016 to address the anomaly in the BMW rules 2016. By this amendment all occupiers of HCF with 10 more than hospital beds, irrespective they are connected or not connected with sewage treatment plant or even if not connected to public sewers have been brought under this rules. All HCF with less than ten beds must commission STP latest by 31 December, 2019. Similarly all HCF which treats patient, but does not have beds for inpatient care, has to dispose the infectious liquid waste only post disinfection according to schedule – II (6) of the main rules. A standard format for submission of the Annual Report by HCF on all aspects of BWM for the duration January- December of the previous year has been approved. The report is to be submitted latest by 01 July of every year without fail. Another milestone in this rules is giving a time line for implementation of **"phasing out use of chlorinated plastic bags**" by 31 Dec 2019.

STUDIES ON BIOMEDICAL WASTE MANAGEMENT.

(a) Shalini Sharma.et al., (2010) submitted project on awareness of biomedical waste management amongst health care professionals on fourteen medical facilities at Agra. The objective was to ascertain the level of awareness of the healthcare personnel from a randomly selected 14 medical centres which included top government hospital, government first referral unit, private HCF and corporate HCF in Agra. The result highlighted lack of knowledge and awareness amongst qualified health personnel on biomedical waste

management. Amongst the four strata the worst awareness was observed in private hospital i.e only 14 persons out of 82 were aware about BMW.

(b) Sinha.N (2008) did study on analysis of BMW management in small hospitals and nursing homes in New Delhi. The sample size included was a total of fifty three nursing homes with bed varying from twenty to over two hundred. The data was collected through questionnaire and observation during field visits. Results showed there was less usage of biomedical waste management practises among these hospitals/nursing homes.

(c) Lieutenant Colonel SKM Rao, Wing Commander RK Ranyal.et.al., (1998) conducted Infrastructural Survey of Hospital from Biomedical Waste Management point of view in few HCF within Pune city. Study was conducted in five hospital in Pune and it included government hospital, private, hospital and charitable hospitals. The objective was to assess the need of infrastructure requirement for better management of biomedical. The cost was work out in respect of hospitals where complete infrastructure required for BMW was available. It was thereafter compared with hospitals which had made compromises in implementation of infrastructure required for BMW Management. The study concluded that benchmarked hospital of 1047 bed capacity incurred a capital cost of Rupees three lacs and fifty nine thousand excluding cost of incinerator with recurring expenditure of Rs 656/- per day. The common regional waste disposal facility operating within Pune city was charging Rupees twenty per kilogram for infectious waste. Study recommended standardization of infrastructural requirement so that a hospital which has implemented the BMW rules sincerely does not have to incur additional costs.

(d) **Niraj Pandit, HK Mehta, GP Kartha et al., (2004)** worked on a project on awareness and practices of BMW management in Sabarkantha district of Gujarat. The aim of the project was to assess the current state of awareness on numerous aspects of BMW

practices amongst the medical practitioners. This cross sectional study included 30 hospitals with 30 beds or more capacity. All Hospital was randomly selected. The doctors and other staff were the study populations. The studies found out that although doctors were aware about the law regarding biomedical waste but they did not know its details. Doctors were also aware of risk linked to HIV, Hepatitis B & C, but staff knowledge in this aspect was very poor. The knowledge scores obtained amongst doctors on BMW, HIV, Hepatitis B/C risk was 80% while it was 45% for other staff. Study highlighted immediate attention to train and educate all concerned person for effective BMW.

(e) **S.Muhammad, Salim Khan, Sheikh Mohd Saleem et.al., (2019)** carried out study on BMW practices at a tertiary level of paediatric hospital in Kashmir valley. A total of 25 interviews were conducted amongst five doctors, staff nurses, pharmacists, laboratory technicians and sanitary personnel respectively. The data was acquired through a pre-tested survey questionnaire on BMW 2016. Results showed that awareness and knowledge about BMW guidelines 2016 was highest amongst laboratory technicians and sanitary personals. The sanitary personals were more aware about existing operational guidelines and proper waste disposal methods as compared to doctors and nurses.

(f) **Datta P, Mohi GK, Chander J (2018)** (J Lab Physicians 2018;10:6-14) conducted a critical appraisal study on BMW management in India. The study reviewed the BMWM rules 2016 and problems related to its proper implementation. Study analysed the limitation of conventional techniques and latest eco friendly techniques of BMW disposal. The study recommended collective teamwork approach supported by government financially as well as infrastructure development. It called for dedicated healthcare workers, continuous monitoring of BMW practices, tough legislature and strong regulatory bodies. Study suggested research and development in the field of developing environmental friendly medical devices and BMW disposal systems for a greener and cleaner environment.

OBJECTIVES

General Objectives:

To study the level of awareness amongst Nursing staff and Housekeeping staff about management of BMW at Venketeshwar Hospital, Dwarka, New Delhi.

Specific Objectives:

(i) To assess the awareness of nursing staff regarding BMW management.

(ii) To assess the awareness of Housekeeping staff regarding BMW handling.

(iii) To find out whether the housekeeping staff are aware of health hazards while dealing with BMW or not?

(iv) To find out whether the hospital is following guidelines as per the latest BMW management and handling rules or not?

(v) To find out whether HK staff and Nurses are aware about action to be undertaken during needle stick injury and spill management protocols.

(vi) To recommend suggestion (if any).

RESEARCH METHOLDOLOGY

Study Design:	Descriptive and cross sectional study
Location of the Study:	Venketeshwar Hospital, Dwarka, New Delhi
Duration of Study:	01 April till 10 May 2019
Study Population:	Nurses and Housekeeping staff
Sample size:	110 (Nursing staff-50 and Housekeeping staff-60).
Sampling Technique:	Convenient sampling.
Data Collection Tools:	Quantitative by self made Structured Questionnaire
	Qualitative by Observation
Data Analysis:	Use of SPSS and excel.
Data Type collected:	Primary and Secondary data

DATA ANALYSIS AND INTERPRETATION

The study was conducted at Venketeshwar Hospital, Dwarka in the month of March - April 2019. The self administered questions asked to 50 x nursing staff and 60 x housekeeping staff were different on the basis of their knowledge level. During the course of the project, an effort was also made to obtain qualitative information related to BMW management practises through observational checklist by making visits to all departments and floors of the hospital where BMW is generated. Interaction with OIC HIC and Manager HK department was done to obtain quantitative data.

Qualitative data : Approach to BMW Management at Venketeshwar Hospital

Venketeshwar hospital started functioning in the same year as BMW (Management& Handling) Rules, 2016 was implemented. The hospital has currently a very good system of biomedical waste management.

BMW is dealt by Housekeeping Department, which is outsourced to SM Workforce. On an average there are approx 200 individual hired from SM workforce, the manpower includes housekeeping, GDA and transportation staff respectively. In addition there are 6 to 7 permanent staffs headed by Manager, HK Department for overall supervision and functioning of the department.

The hospital has a Memorandum of understanding with Synergy Waste Water Grace, Private Limited, Nilothi a CBMWTF for disposal and transportation of BMW. BMW is collected by the company representative from hospital premise once a day around 9-10 am daily.

BMW is transported to biomedical room located at Base 2 by respective floors twice in a day i.e. one by 8 am and another between 6-7 pm in trolleys in segregated colour bags. Thereafter it is kept in large bins at biomedical room which are demarcated for red and yellow BMW.

Cytotoxic waste is kept in yellow bins and the bags are labelled with "C". BMW kept in Blue and white container is also kept segregated.

Laboratory waste is pre-treated at the autoclave machine kept at biomedical room by technician from laboratory daily as and when the same is brought. The waste blood from Waste from Blood bank department is pre-treated at source and thereafter brought here.

Weighing of BMW as per the colour bins is done daily in the morning and thereafter bar coding is also done. A daily BMW waste disposal record is maintained by the supervisor and biomedical waste is thereafter handed over to the representative of the CBMWTF.

The floor of biomedical room is then cleaned daily for spills of anytime by HK staff.

Management of BMW at Various Floors

There is a dirty room at each floor where large bins are kept for biomedical waste. Small size biomedical bins are kept in all wards in sufficient quantity for disposal of waste according to category. The filled bins are emptied from wards/medication room into large trolley kept at dirty utility room in each floor. Thereafter, the same is shifted to Base 2 location in trolleys via dirty lift.

Dedicated HK manpower in close coordination with senior nurses at each wards/sample collection room/Accident and Emergency and various OTs/ICUs are responsible for transportation of the BMW from respective locations to biomedical room at Base 2.

Laboratory and CSSD has a dedicated pipeline laid upto ETP for initial treatment and further onward disposal to STP, which is collocated with ETP n the base 3 floor.

Flow of Biomedical Waste within the Hospital:

The following is the general flow of waste:-

General waste	Biomedical waste generated at wards/ medication room (Segregated category wise)
↓	↓
No treatment	Dirty Utility room
↓	↓
Ward HK Staff	Dirty lift/Trolleys
↓	↓ (7-8 am & 6-7 pm)
Black bins at Dirty Utility	Biomedical Room at Base 2
↓	↓
Transported by trolley by dirty lift	Handed over to SMS Water grace BMW Private Limited
↓	↓
Disposed in Municipal Bins	Transported to CBMWTF at Nilothi for further disposal /treatment

Note: All people dealing with BMW wear PPE.

Other observed details related to BMW management

- Venketeshwar hospital has a nodal officer nominated for BMW management.
- HICC is headed by Dr Swati Lalchandani, Microbiologist which meets every three months whereas biomedical waste management committee is headed by director medical.
- Both BMW Committee and HICC are integrated.
- Venketeshwar Hospital has submitted the annual BMW report for the year 2018-19 to CPCB. In addition it regularly submits monthly report to required authorities.
- Daily class on HK issues including BMW is given to HK staff at 730 am as per monthly training schedule approved.
- All evening shift Nurses undergo in service training class between 1 pm to 2 pm which is conducted by ICN.
- All nurses and housekeeping staff are in general aware about needle stick injury and spill management protocols.
- ICU- 6 sets of BMW bins are kept in each ICU. BMW is sent to biomedical room at base 2 from here through dirty utility room.
- OTs- During operation, biomedical waste is segregated by treating doctors/supporting nurse in colour bins. Thereafter, HK staff moves it to Dirty room. From here it is directly taken to base 2.
- Maximum Cytotoxic waste is generated from the **Onco** ward located at 9th floor and 3rd floor ICU/CCU /Day care. All waste generated from this two wards are kept in yellow bags labelled as “C”.

- The average daily load of biomedical waste disposed into various color bins is as under:-

  Red: 140 Kgs Yellow: 130 Kgs Blue: 44 Kgs

  Cytotoxic: 03 Kgs Sharp: 4.5Kgs

- Non chlorinated bags are being used for disposal of BMW as per guidelines of BMW (Amendment) Rules, 2018.
- Closed trolley is used for transportation of waste from all floors to the designated biomedical room at base 2.
- Vaccination record of nurses, HK and other health care workers are maintained month wise.
- A very high standard of record keeping is maintained for BMW management of the hospital. The nodal officer has uploaded its annual report and monthly BMW report on its website.
- SOP on BMW is existing but needs to be updated incorporating mandatory changes in the government ruling which all occupier of HCF have to as per latest rules.

Table 3: Observational Checklist

SER No	CHECKLIST	YES	NO
1	Is BMW management Policy/SOP existing	✓	
2	Nodal officer nominated in Hospital	✓	
3	Pre-treatment of laboratory waste	✓	
4	Use of non chlorinated plastic bags	✓	
5	No blame approach to incident reporting promoted	✓	
6	Free access to PEP	✓	
7	Sufficient budget provided for PEP & BMW Stores	✓	
8	Is BMW and HIC integrated	✓	
9	PPE worn by BMW handlers all times	✓	
10	Bar coding of BMW	✓	
11	Awareness about procedure of needle stick injury incidence	✓	
12	General attitude of Staff towards BMW	✓ Very good	
13	Annual report of BMW submitted for year 2018-19 to appropriate authorities	✓	
14	Is monthly BMW report being submitted regularly	✓	

Results of Nursing Staff to Survey Questionnaire.

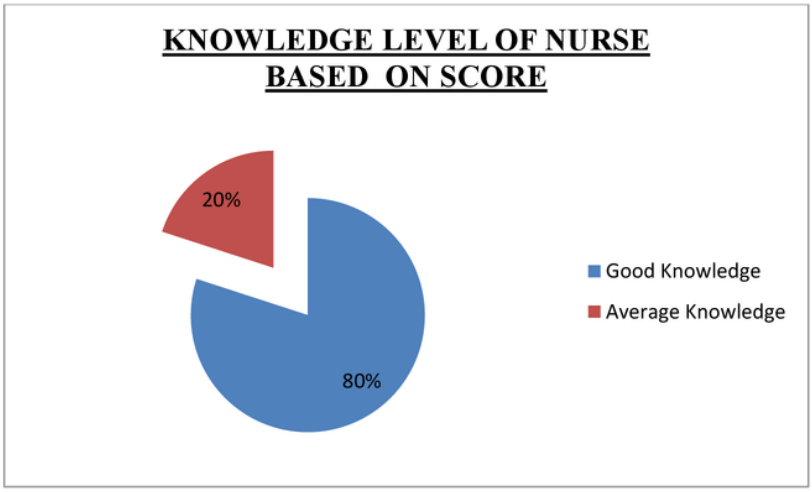
All volunteer nurses were asked to respond to thirteen questions. Scores were given for 11 questions only and analysis of knowledge of Nursing Staff was done by dividing it into 3 categories i.e.

- Good Knowledge
- Average Knowledge
- Poor Knowledge

Table 4: Classification of knowledge level of nurses on score basis

S.No	category	Full score	Score obtained	Total Nurses
1	Good Knowledge	11	11	40
2.	Average Knowledge	11	8-10	10
3.	Poor Knowledge	12	0-7	-

Figure 1: Data Analysis of Knowledge level of the Nursing staff



Interpretation

- 40 out of 50 nurses scored 11out of 11 i.e. 80% Nurses have got good knowledge levels on BMW management.
- 10 nurses out of 50 nurses scored between 8 to 10 i.e. 20% nurses have average knowledge level of BMW management.
- No nurses have poor knowledge level of BMW management as no one out of 50 nurses scored less than 8.

Table 5: Summary: Survey questionnaire of Nurses regarding BMW

Questions	Yes	No
Awareness about the biomedical waste	50	-
Awareness regarding what BMW includes	40	10
Awareness of color coding segregation	50	-
Knowledge of different color bags used in BMW	41	9
Knowledge about disposal of soiled dressing and human waste	41	9
Knowledge about disposal of waste sharps	42	8
Knowledge about the solution in puncture proof container	29	21
Knowledge about major risks while dealing with biomedical waste	50	-
Knowledge about different types of disinfectant methods	44	6
Identification of biohazard symbol	46	4
Knowledge about safety measure taken during spillage of BMW	49	1

SURVEY ON AWARENESS OF NURSING STAFF ON BIOMEDICAL WASTE

Statistics

		SEX OF NURSE	AGE OF NURSE IN YEARS	TOTAL SERVICE IN VENKETESHWAR	AWARENESS OF BMW	KNOWS WHAT BMW INCLUDES	AWARENESS ABOUT COLOR CODING	DIFFERENT COLOR BINS USED
N	Valid	50	50	50	50	50	50	50
	Missing	0	0	0	0	0	0	0

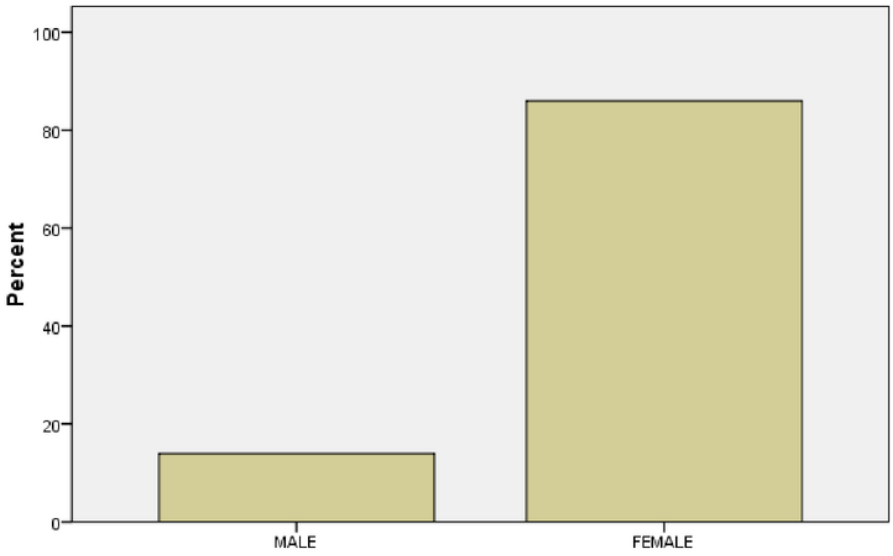
		DISPOSAL OF WASTE SHARPS	MAJOR RISK IN DEALING WITH HOSPITAL WASTE	VACCINATION FOR HEPATITIS B AND TETANUS	SYMBOL OF BIOHAZARD	ACTION DURING SPILLS	UNDERWENT TRAINING ON BMW HANDLING AT HOSPITAL	DIFFERENT TYPES OF DISINFECTION METHODS
N	Valid	50	50	50	50	50	50	50
	Missing	0	0	0	0	0	0	0

Interpretations: All responses of the 50 nurses to various survey questions have been captured. There is no missing data.

Gender of Nurses

		Frequency	%t	Valid %t	Cumulative %
Valid	MALE	7	14.0	14.0	14.0
	FEMALE	43	86.0	86.0	100.0
	Total	50	100.0	100.0	

Figure 2: Gender of Nurses

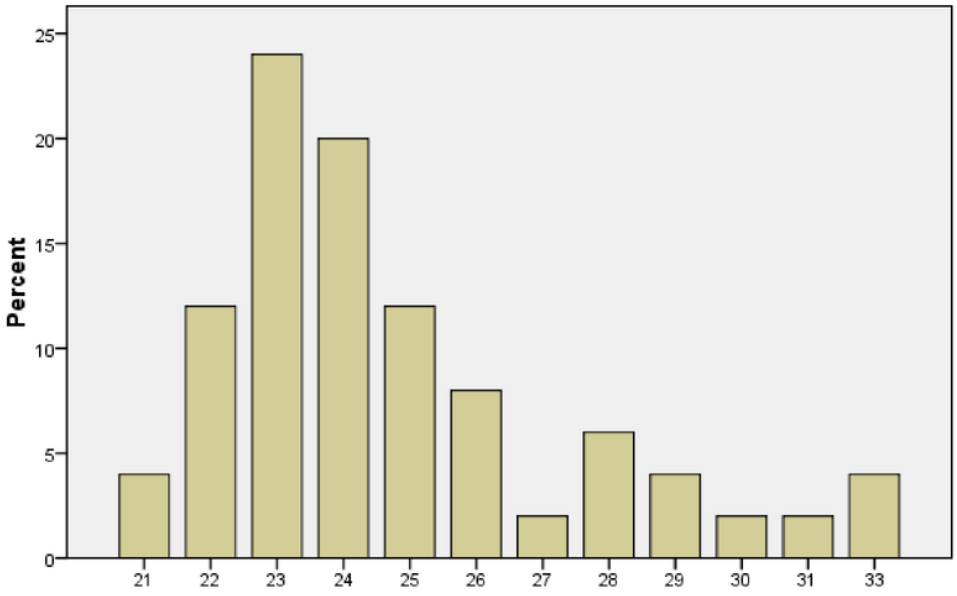


Interpretation: 14 % of the nurses (7) are male and 86 % are females (43).

Age of Nurse in years

		Frequency	%	Valid %	Cumulative %
Valid	21	2	4.0	4.0	4.0
	22	6	12.0	12.0	16.0
	23	12	24.0	24.0	40.0
	24	10	20.0	20.0	60.0
	25	6	12.0	12.0	72.0
	26	4	8.0	8.0	80.0
	27	1	2.0	2.0	82.0
	28	3	6.0	6.0	88.0
	29	2	4.0	4.0	92.0
	30	1	2.0	2.0	94.0
	31	1	2.0	2.0	96.0
	33	2	4.0	4.0	100.0
	Total	50	100.0	100.0	

Figure 3 – Age of Nurses



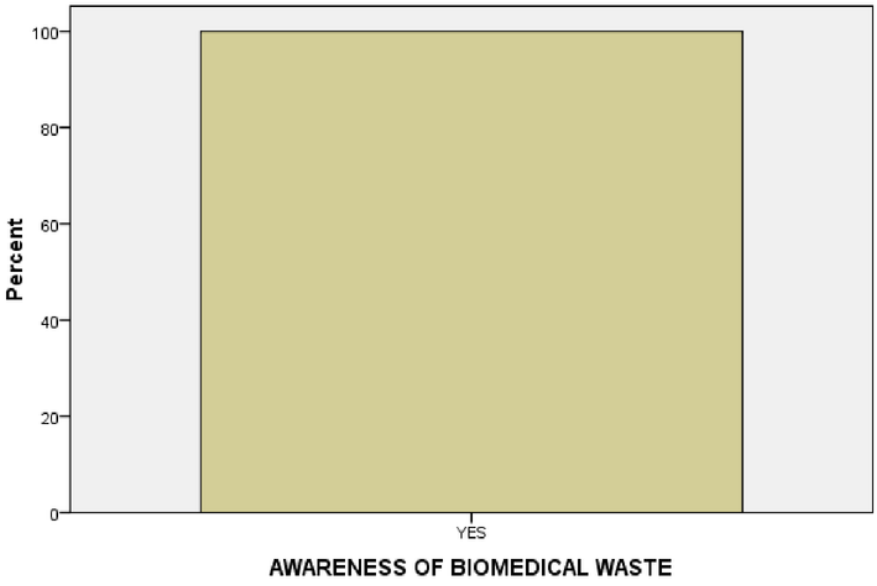
Interpretation

The study population ranges from 21 years to 33 years. Most of the nurses part of the study fall in age group 22 to 26 year's i.e 76% (38 nurses).

Awareness of biomedical waste in Nurses

		Frequency	%	Valid %	Cumulative %
Valid	YES	50	100.0	100.0	100.0

Figure 4- Awareness of biomedical waste in Nurses

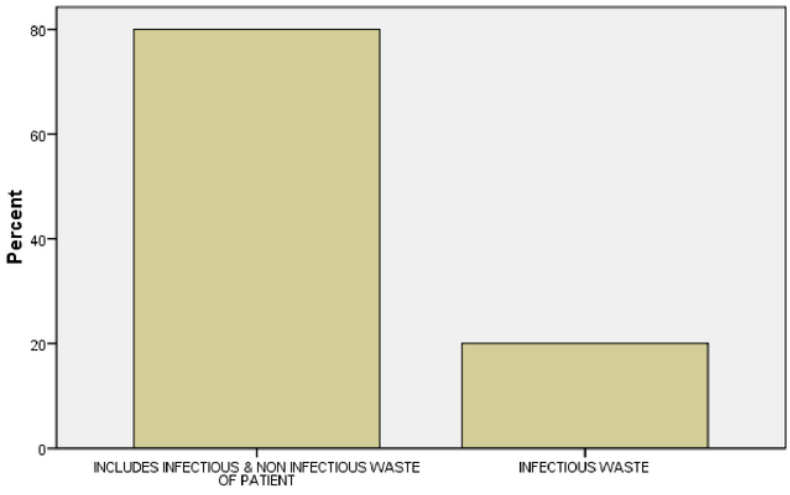


Interpretation 100 % Nurses are aware of biomedical waste.

Knows what BMW includes

		Frequency	%	Valid %	Cumulative %
Valid	Includes infectious & non infectious waste of patient	40	80.0	80.0	80.0
	Infectious waste	10	20.0	20.0	100.0
	Total	50	100.0	100.0	

Figure 5 - Awareness of Nurses on what BMW includes



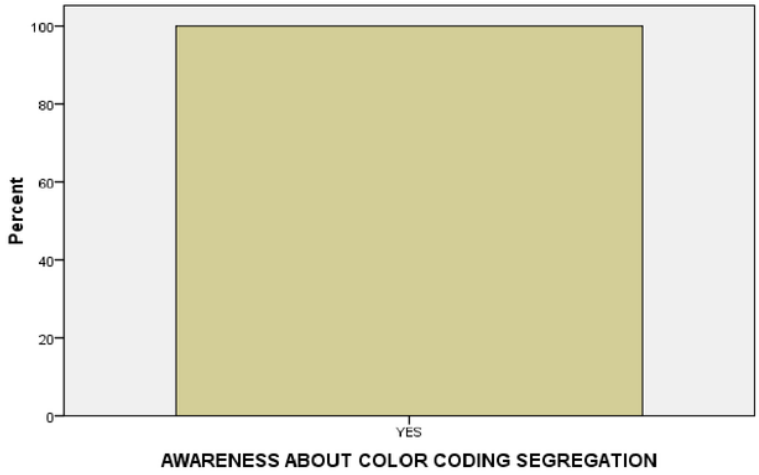
Interpretation

- 40 out of 50 nurses correctly identified what BMW includes i.e. 80% whereas 10 nurses i.e 20% could not identify same correctly.

Awareness about color coding segregation

	Frequency	%	Valid %	Cumulative %
Valid YES	50	100.0	100.0	100.0

Figure 6 - Awareness of Nurses on Color Coding Segregation



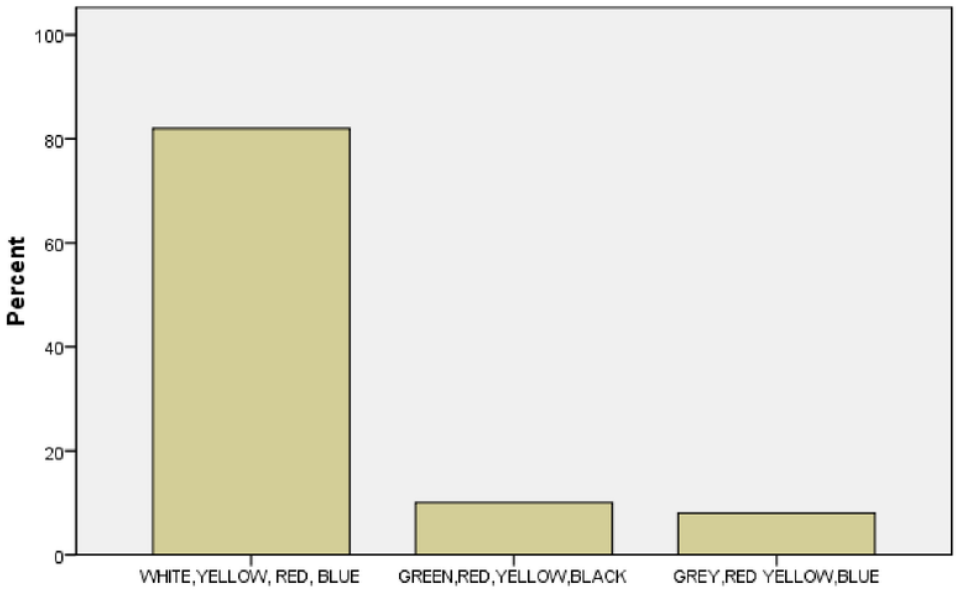
Interpretation

- 100% nurses are aware about color coding segregation.

Awareness of Different Color Bins/bags Used

		Frequency	%	Valid %	Cumulative %
Valid	White, Yellow, Red, Blue	41	82.0	82.0	82.0
	Green, Red, Yellow, Black	5	10.0	10.0	92.0
	Grey, Red Yellow, Blue	4	8.0	8.0	100.0
	Total	50	100.0	100.0	

Figure 7- Nurses awareness on different Color bins Used



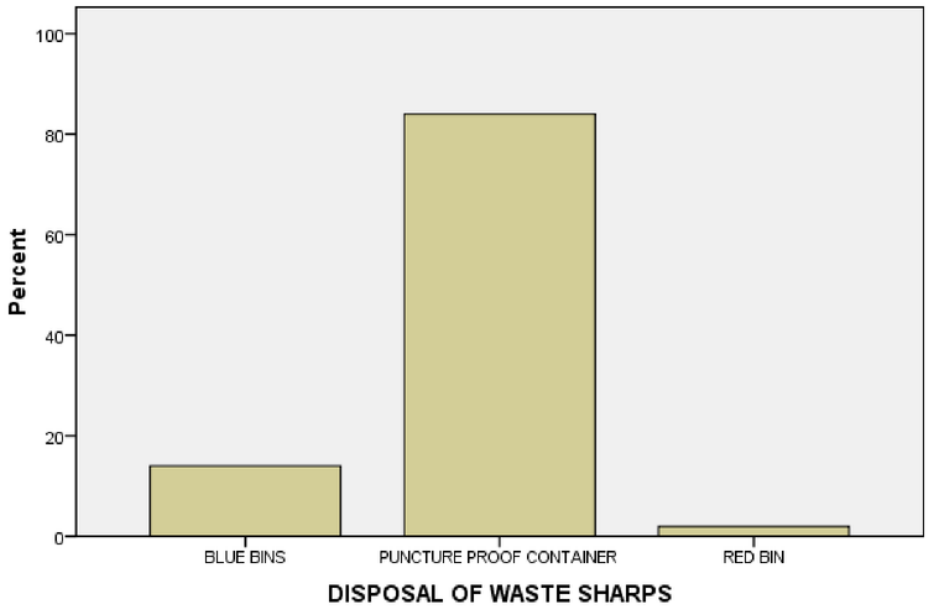
Interpretation

- 41 nurses out of 50 i.e. 82 % correctly identified the four types of color bins/bags used in BMW whereas 18 % were not aware of correct color codes.

Disposal of waste sharps

		Frequency	%	Valid %	Cumulative %
Valid	BLUE BINS	7	14.0	14.0	14.0
	PUNCTURE PROOF CONTAINER	42	84.0	84.0	98.0
	RED BIN	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

Figure 8- Awareness of Nurse on disposal of Waste Sharps



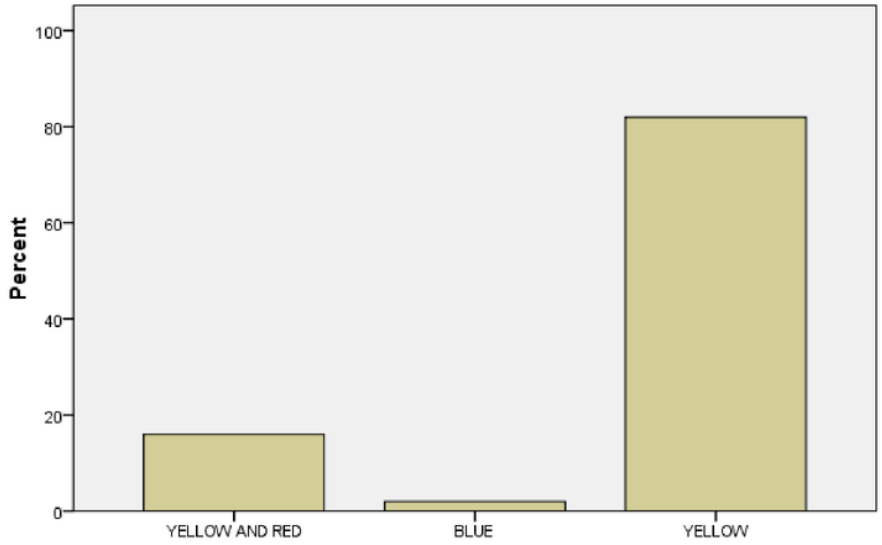
Interpretation

- 42 Nurses i.e. 84 % correctly identified disposal of waste sharps in puncture proof container.

Bins used for human anatomical & soiled waste Disposal

		Frequency	%	Valid %	Cumulative %
Valid	YELLOW AND RED	8	16.0	16.0	16.0
	BLUE	1	2.0	2.0	18.0
	YELLOW	41	82.0	82.0	100.0
	Total	50	100.0	100.0	

Figure 9 Awareness of Bins used for Human anatomical & soiled waste disposal.



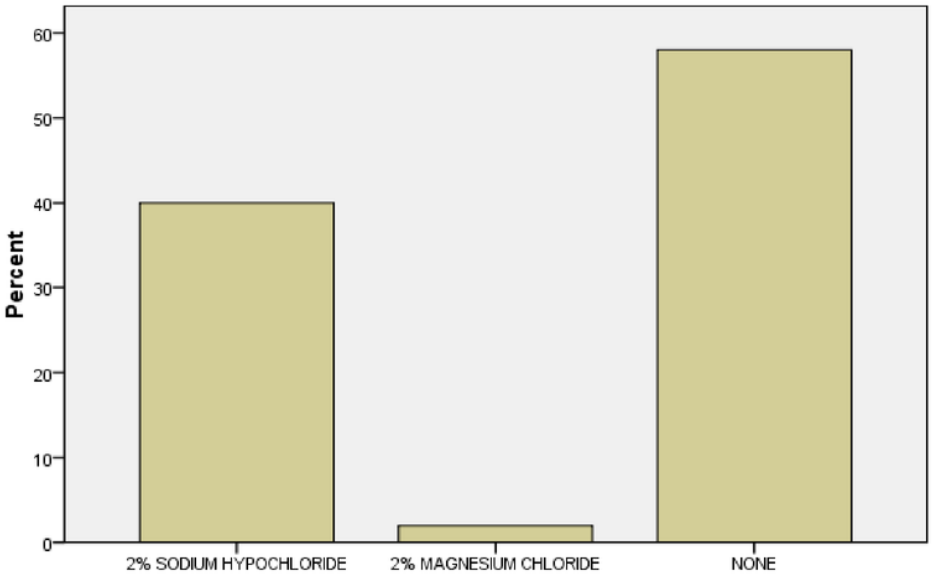
Interpretation

41 Nurses i.e.82 % correctly identified that yellow bins is used for disposal of human and soiled waste.

Knowledge of solutions used in Puncture Proof Container

		Frequency	%	Valid %	Cumulative %
Valid	2% SODIUM HYPOCHLORIDE	20	40.0	40.0	40.0
	2% MAGNESIUM CHLORIDE	1	2.0	2.0	42.0
	NONE	29	58.0	58.0	100.0
	Total	50	100.0	100.0	

Figure 10- Knowledge of Nurses on solution used in puncture proof container



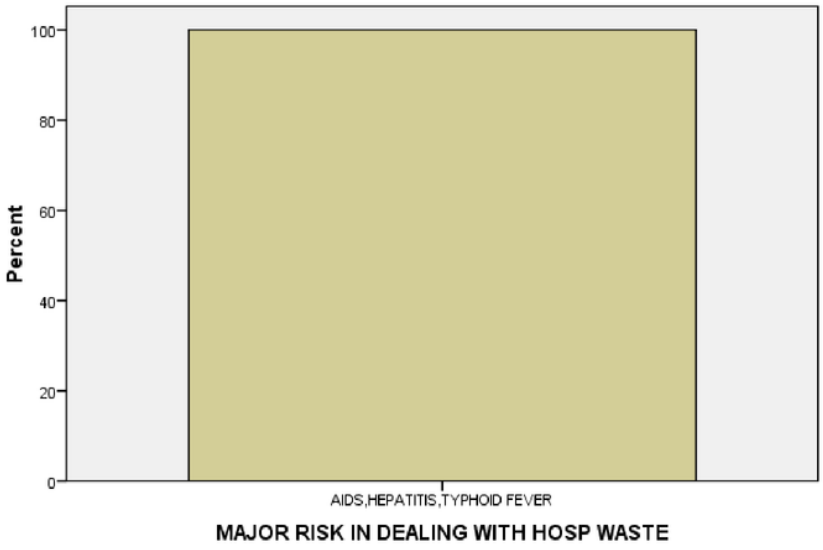
Interpretation

- 29 out of 50 nurses (58%) correctly said that no solution is needed in puncture proof container while 21 Nurses (42%) were not able to identify

Awareness of Nurses on major risk associated with BMW

		Frequency	%	Valid %	Cumulative %
Valid	AIDS,HEPATITIS,TYPHOID FEVER	50	100.0	100.0	100.0

Figure 11- Awareness of Nurses on major risk associated with BMW.



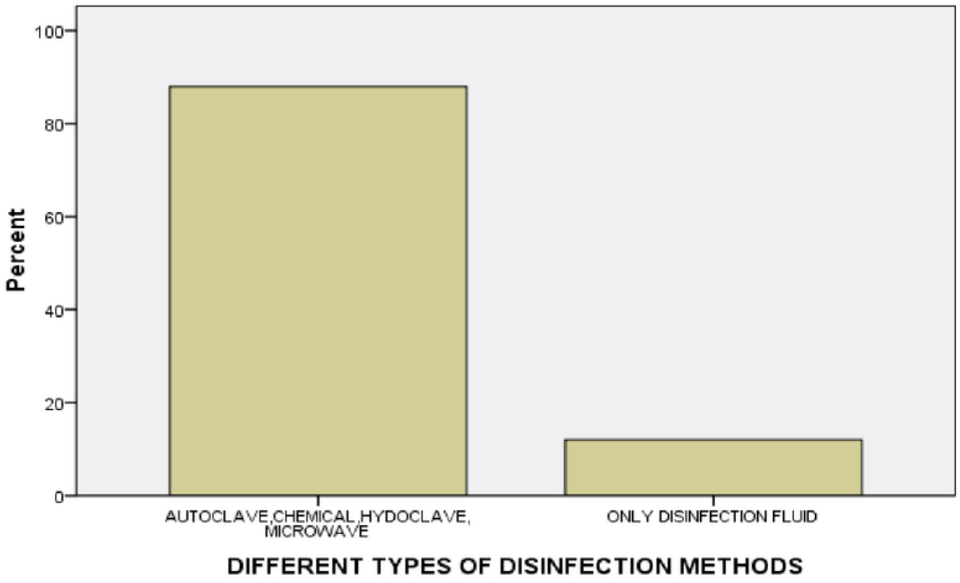
Interpretation

100% study population was aware about major risk associated while dealing with BMW.

Different Types of Disinfection method

		Frequency	%	Valid %	Cumulative %
Valid	AUTOCLAVE,CHEMICAL,HYDOCLAVE, MICROWAVE	44	88.0	88.0	88.0
	ONLY DISINFECTION FLUID	6	12.0	12.0	100.0
	Total	50	100.0	100.0	

Figure 12-Different Types of Disinfection Method



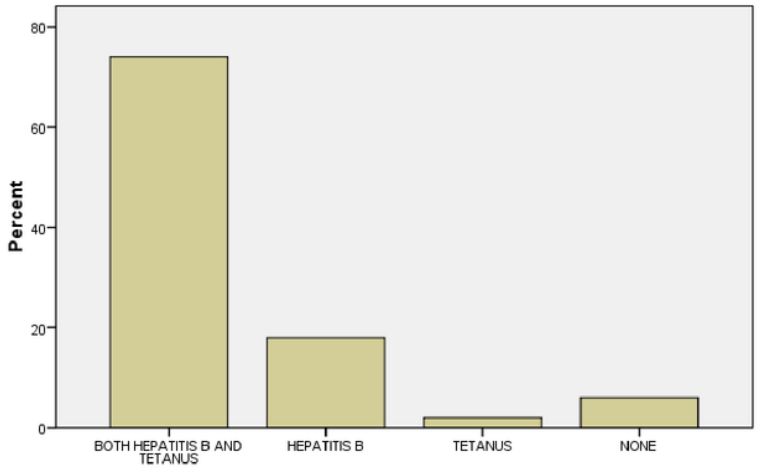
Interpretation

- 88% i.e. 44 out of 50 nurses were completely aware of various disinfection methods.

Vaccination For Hepatitis B And Tetanus

		Frequency	%	Valid %	Cumulative %
Valid	BOTH HEPATITIS B AND TETANUS	37	74.0	74.0	74.0
	HEPATITIS B	9	18.0	18.0	92.0
	TETANUS	1	2.0	2.0	94.0
	NONE	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

Figure 13- Vaccination For Hepatitis B And Tetanus



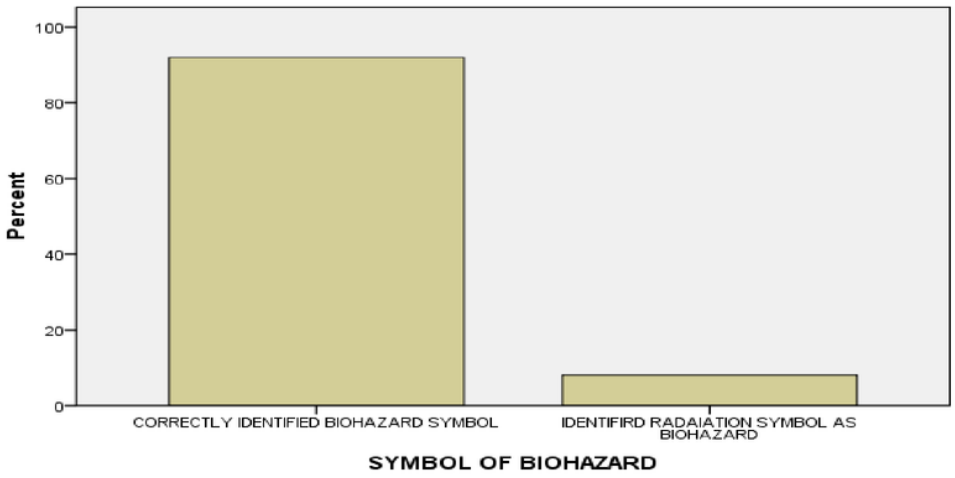
Interpretation

- 74 % Nurses have been vaccinated for both hepatitis B and Tetanus injection.
- 3 nurses i.e 6 % have not got any vaccine and they must be vaccinated immediately.
- 20% (10 nurses) nurses have only got either of the vaccine and effort must be on to vaccinate them fully.

Symbol Of Biohazard

		Frequency	%	Valid %	Cumulative %
Valid	Correctly identified biohazard symbol	46	92.0	92.0	92.0
	Identified radiation symbol as biohazard	4	8.0	8.0	100.0
	Total	50	100.0	100.0	

Figure 14- Identification of Biohazard symbol



Interpretation

- 42 nurses i.e. 92 % correctly identified biohazard symbol whereas 4 nurses i.e. 8 % were unable to do so.

Action during Spills

		Frequency	%	Valid %	Cumulative %
Valid	After cleaning with disinfectant throw infected material in correct bins	49	98.0	98.0	98.0
	Clean infected area without disinfectant	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

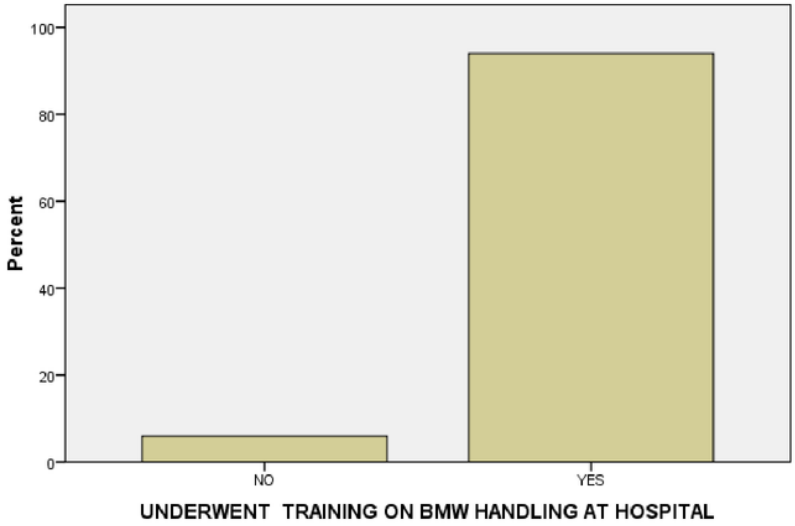
Figure 15- Action during Spills

Interpretation 49 out of 50 nurses correctly were aware of action to be taken during spills i.e. 98 % correct response.

Nurses who underwent training on BMW handling at Hospital

		Frequency	%	Valid %	Cumulative %
Valid	NO	3	6.0	6.0	6.0
	YES	47	94.0	94.0	100.0
	Total	50	100.0	100.0	

Figure 16- Nurses who underwent training on BMW handling at Hospital



Interpretation

- 47 out of 50 nurses i.e. 94 % have undergone training on BMW management at the hospital.

RESULT OF SURVEY: HOUSEKEEPING STAFF

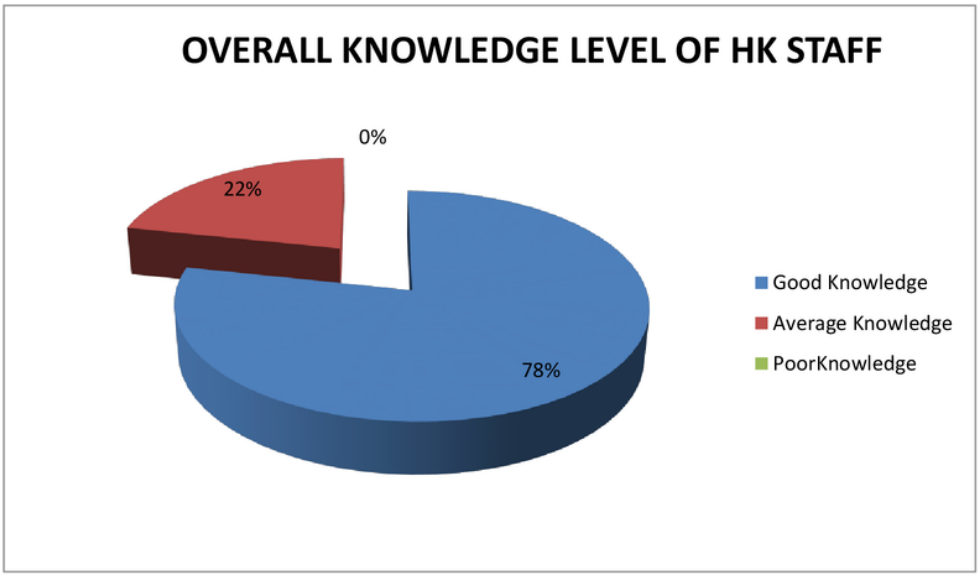
The Sample size for Housekeeping staff was 60. A total of 11 questions were asked in survey questionnaire given to the housekeeping staff. Scores were given for 08 questions only and analysis of knowledge of Nursing Staff was done by dividing it into 3 categories i.e.

- Good Knowledge
- Average Knowledge
- Poor Knowledge

Table 6: Classification of knowledge level of HK on basis of Scores

S.No	Various categories	Full score	Score obtained	Total Nurses
1	Good Knowledge	8	8	47
2.	Average Knowledge	8	5-7	13
3.	Poor Knowledge	8	0-4	-

Figure 17- Data Analysis of Knowledge level of HK Staff



Interpretation

- 47 out of 60 housekeeping staff scored 8 out of full 8 marks i.e. 78 .33% housekeeping staff has got good knowledge levels on BMW management.
- The balance 13 housekeeping staff out of 60, scored between 5 -7 i.e. 21.6 % have average knowledge level of BMW management.
- No Housekeeping staff has poor knowledge level of BMW management as no one out of 60 housekeeper scored less than 5.

Table 7: Summary of response to Survey Questionnaire of Housekeeping Staff.

Questions	Yes	No
Awareness about the biomedical waste	60	0
Knows what BMW includes	50	10
Awareness regarding Colour coding segregation of BMW	60	-
Awareness regarding different Colour Bags used in BMW	47	13
Awareness of vaccination of Both Hepatitis B and Tetanus	52	8
Identification of biohazard symbol	58	3
Awareness of complete PPE worn during handling of BMW handling	55	5
Awareness about injury due to Needle stick injury	60	-
Awareness on avoidance of crowded area during transportation of BMW	59	1
Is any training provided for handling of Biomedical waste	60	-
Is training programme effective in providing knowledge about BMW	60	-

STATISTICS OF HOUSEKEEPING STAFF OBTAINED BY SPSS

		GENDER OF HK STAFF	KNOWS WHAT BMW INCLUDES	AWARE OF BMW	AWARE ABOUT COLOR CODING	COLOR BINS USED	VACCINATION FOR HEPATITIS B & TETANUS	IDENTIFY BIOHAZARD SYMBOL
6								
N	Valid	60	60	60	60	60	60	60
	Missing	0	0	0	0	0	0	0

		PPE WORN BY WASTE HANDLER	NSI CAN RESULT IN INFECTION	AVOID CROWDED AREA DURING TRANSPORTATION OF BMW	TRAINING GIVEN ON BMW AT HOSPITAL	INDIVIDUAL BENEFITTED FROM BMW TRAINING
6						
N	Valid	60	60	60	60	60
	Missing	0	0	0	0	0

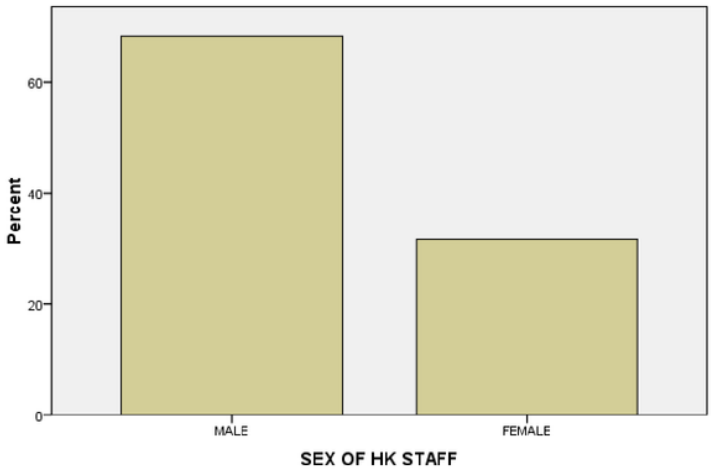
Interpretation:

- All 60 housekeeping staff has responded to all question and all data was captured and no data is missing.

Gender of HK Staff

		Frequency	%	Valid %	Cumulative %
Valid	MALE	41	68.3	68.3	68.3
	FEMALE	19	31.7	31.7	100.0
	Total	60	100.0	100.0	

Figure 18- Gender of HK Staff



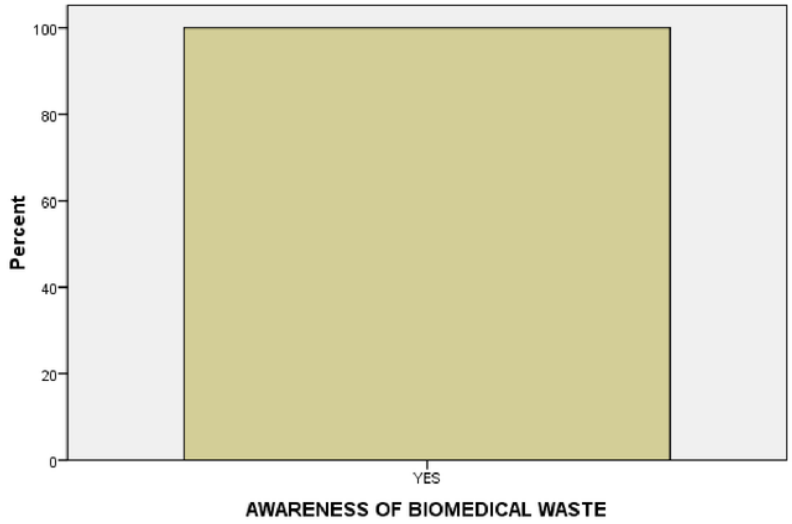
Interpretation

- 41 male (68.3 %) male and 19 Female housekeeping staff (i.e. 31.7%) participated in the survey.
- Good gender representative.

Awareness of HK on BMW

		Frequency	%	Valid %	Cumulative %
Valid	YES	60	100.0	100.0	100.0

Figure 19- Awareness of HK on BMW



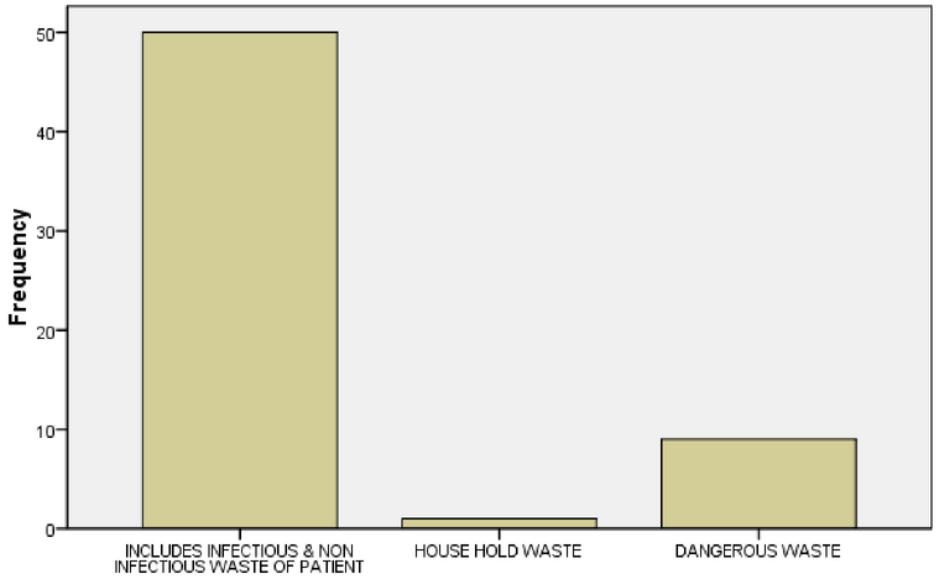
Interpretation

- All housekeeping staff i.e 100% are aware of what is biomedical waste.

HK : Knows what BMW includes

		Frequency	%	Valid %	Cumulative %
Valid	Includes infectious & non infectious waste of patient	50	83.3	83.3	83.3
	House hold waste	1	1.7	1.7	85.0
	Dangerous waste	9	15.0	15.0	100.0
	Total	60	100.0	100.0	

Figure 20- Knows what BMW includes

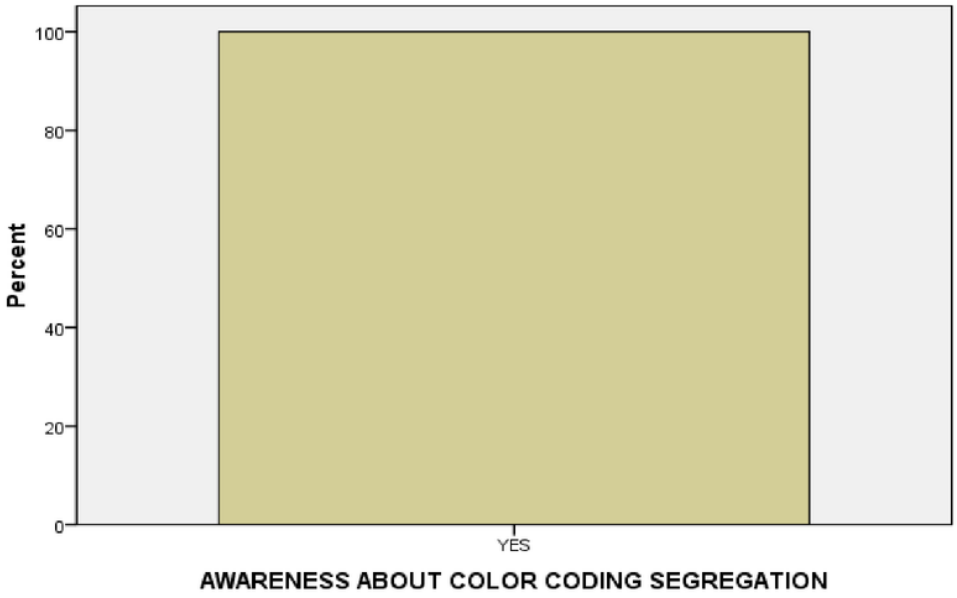


Interpretation. 50 out of 60 HK staff i.e. 83.3% are aware and knows what all BMW includes. 9 HK (15%) incorrectly said dangerous good and 1 (1.7 %) said BMW includes household good.

Awareness of HK About Color Coding Segregation

		Frequency	%	Valid %	Cumulative %
Valid	YES	60	100.0	100.0	100.0

Figure 21- Awareness about Color coding segregation



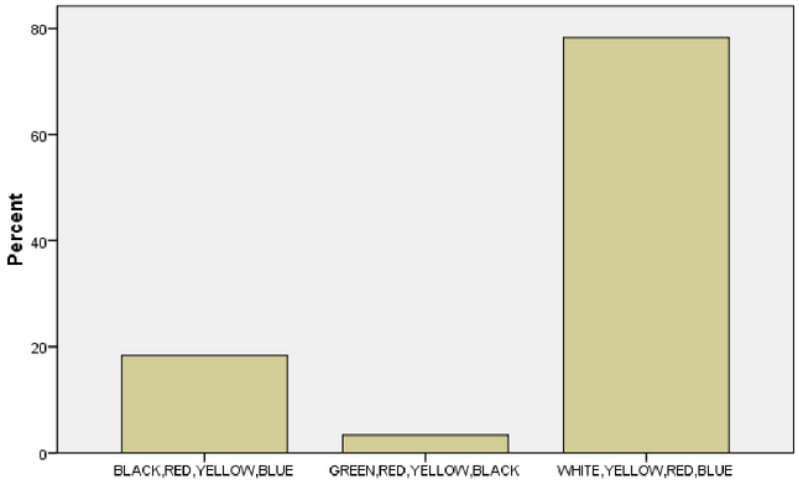
Interpretation

- 100 % staff is aware about color coding segregation

Awareness of HK on Different Color Bins Used

		Frequency	%	Valid %	Cumulative %
Valid	Black,Red,Yellow,Blue	11	18.3	18.3	18.3
	Green,Red,Yellow,Black	2	3.3	3.3	21.7
	White,Yellow,Red,Blue	47	78.3	78.3	100.0
	Total	60	100.0	100.0	

Figure 22- Awareness of HK on Different Color Bins Used



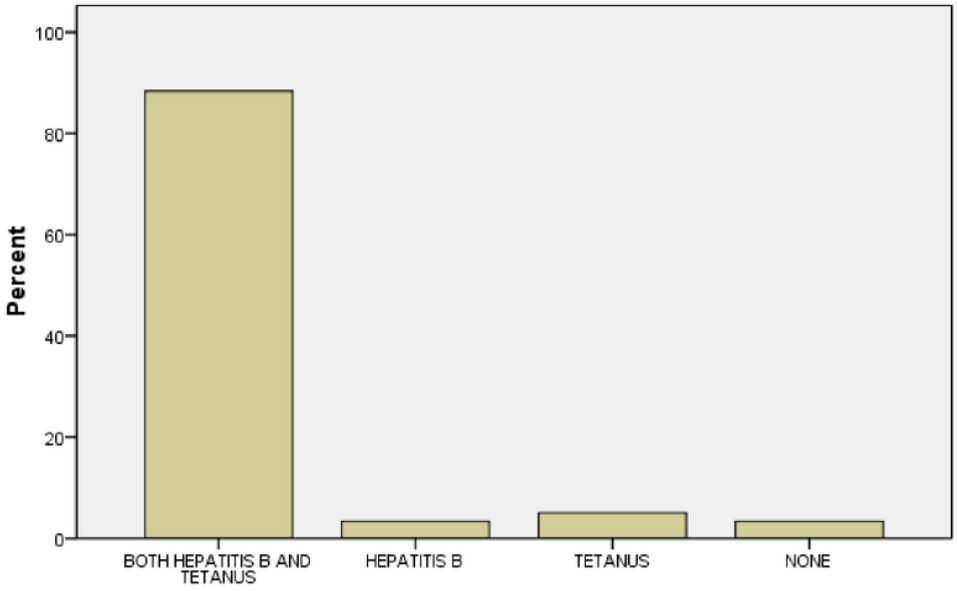
Interpretation

- 47 out of 60 (78.3 %) are correctly aware about the four types of color bins used in BMW.
- 13 out of 60 i.e. 21.7 % are not aware about the correct color bins.

Vaccination of HK For Hepatitis B And Tetanus

		Frequency	%	Valid %	Cumulative %
Valid	Both Hepatitis B And Tetanus	53	88.3	88.3	88.3
	Hepatitis B	2	3.3	3.3	91.7
	Tetanus	3	5.0	5.0	96.7
	None	2	3.3	3.3	100.0
	Total	60	100.0	100.0	

Figure 23- Vaccination of HK for Hepatitis B and Tetanus



Interpretation 88.3 % i.e 53 out of 60 are completely vaccinated for both Hepatitis B & Tetanus. About 3.3 % i.e 2 out of 60 have not got any vaccination whereas 8.3 % ie balance 5 have either been vaccinated for Hepatitis B or Tetanus.

Awareness of HK on Identification Of Biohazard Symbol

		Frequency	%	Valid %	Cumulative %
Valid	Correctly Identified Biohazard Symbol	58	96.7	96.7	96.7
	Identified Cytotoxic Symbol	2	3.3	3.3	100.0
	Total	60	100.0	100.0	

Figure 24- Awareness of HK on Identification Of Biohazard Symbol

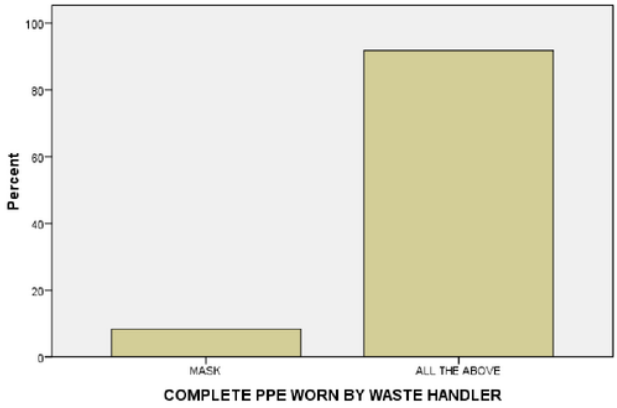
Interpretation 58 out of 60 i.e 96.7 % have correctly identified the biohazard symbol.

Only 3.3 % were unable to do so.

Complete PPE Worn By Waste Handler

		Frequency	%	Valid %t	Cumulative %
Valid	MASK	5	8.3	8.3	8.3
	ALL THE ABOVE	55	91.7	91.7	100.0
	Total	60	100.0	100.0	

Figure 25- Awareness on Complete PPE equipment worn while Handling BMW



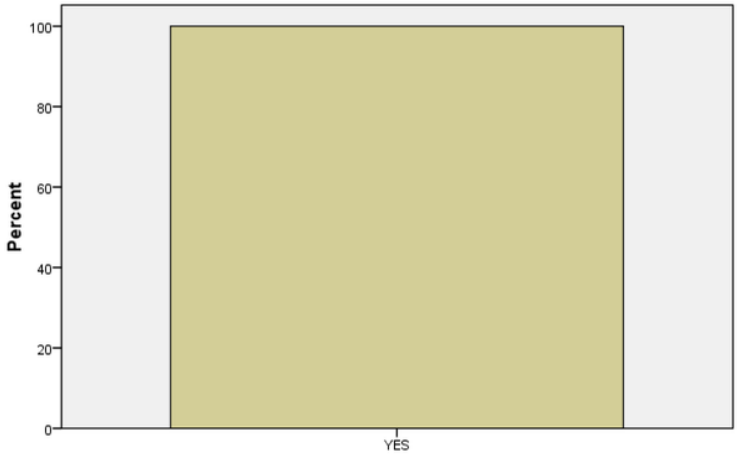
Interpretation

- 55 out of 60 HK staff i.e. 91.7 % is fully aware of the complete PPE equipment to be worn during handling of BMW.
- Balance 5 out of 60 i.e. 8.3 % are not fully aware.

Awareness of HK that NSI can Result in Infection

	Frequency	%	Valid %	Cumulative %
Valid YES	60	100.0	100.0	100.0

Figure 26- Awareness of HK that NSI can result in Infection



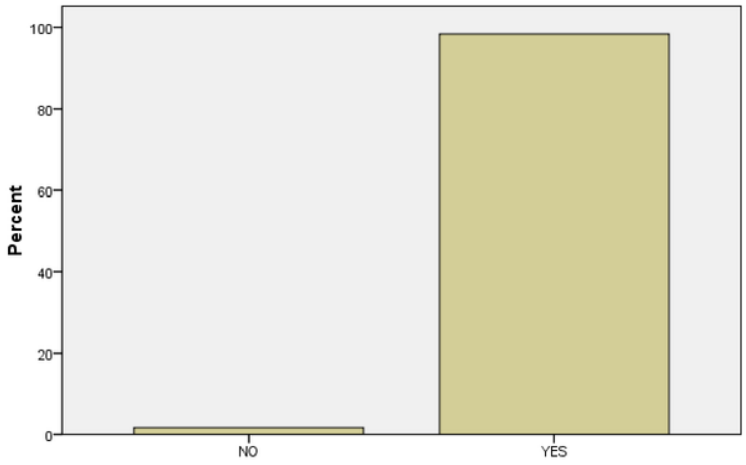
Interpretation

- All 60 staff i.e. 100 % are aware that needle stick injury causes infection.

Avoidance Of Crowded Area while transporting BMW

		Frequency	%	Valid %	Cumulative %
Valid	No	1	1.7	1.7	1.7
	Yes	59	98.3	98.3	100.0
	Total	60	100.0	100.0	

Figure 27- Avoidance of crowded area while transporting BMW

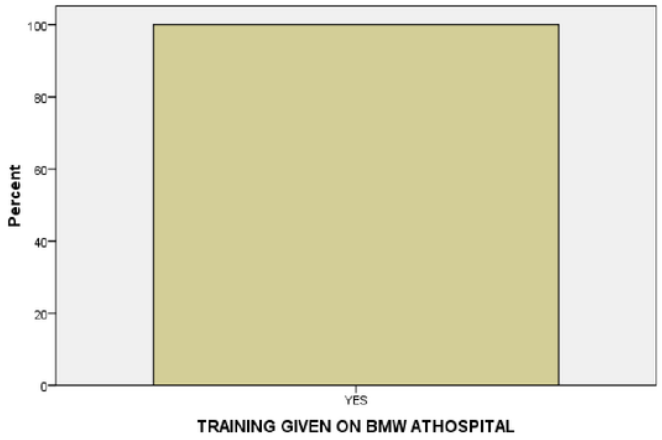


Interpretation 59 out of 60 staff i.e. 98.3 % are aware that crowded area has to be avoided while transporting BMW to storage room at Base 2 location.

Training given to HK Staff on BMW at Hospital

	Frequency	%	Valid %	Cumulative %
Valid YES	60	100.0	100.0	100.0

Figure 28- Training given to HK Staff on BMW at Hospital



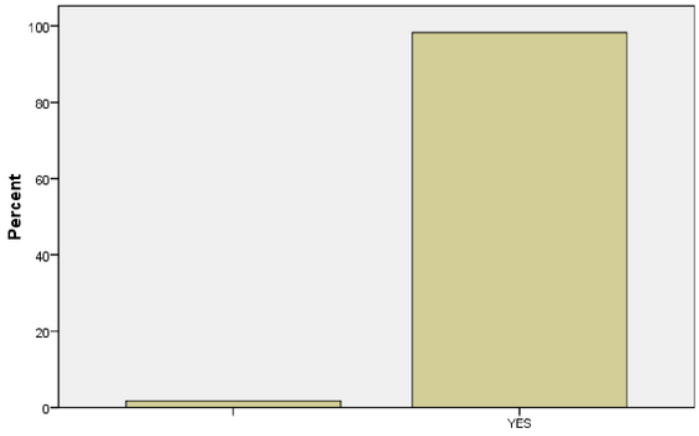
Interpretation

100 % housekeeping staffs have been given training on BMW at hospital premise which is an excellent commitment of administration to BMW.

Data on Individual Benefitted From BMW Training

	Frequency	%	Valid %	Cumulative %
Valid	1	1.7	1.7	1.7
YES	59	98.3	98.3	100.0
Total	60	100.0	100.0	

Figure 29- Awareness of HK staff on Individual benefitted from BMW Training



Interpretation

- 98.3 % staffs have acknowledged that they have benefitted from BMW training.

DISCUSSION

This was a cross sectional and descriptive study conducted within Venketeshwar Hospital, Dwarka on awareness of nurses and housekeeping staff on biomedical waste management. Approximately, the hospital has 300 nurses and about 210 housekeeping staff. Out of the total strength, 50 nurses' i.e. about 17 % and 60 housekeeping staff i.e. about 28 % participated in the survey. The information on BMW was obtained on analysis of response to questionnaire received from willing study subjects. Data confidentiality was ensured. Qualitative data was obtained by observation by visiting all departments where BMW is generated and segregated at source. Daily interaction with staff at biomedical/ barcode room was made as per critical moment of storage and disposal of BMW. Briefing from manager HK and OIC HIC was obtained with regards to BMW management.

Overall based on score, 80% Nurses and 78.33% housekeeping staff have got a good knowledge levels on BMW management respectively. All nurses and housekeeping staff have a very high level of awareness about BMW, color coding segregation, major risk associated with improper handling of BMW and generally they were able to identify biohazard symbol. Nurses are aware of spills management and disinfection methods. However, only 60 % were able to correctly identify the four types of color bags used in BMW. Similarly, 92% of nurses and 96.7% of HK staff was able to identify the biohazard symbol correctly. All those staff who has not been vaccinated against Hepatitis B and Tetanus needs to be vaccinated on priority.

Key Findings

- 100 % nurses and housekeeping staff are aware about BMW, and colour coding segregation.
- 82 % of nursing staff and 78 % housekeeping staff are aware of the four types of colour bags/bins used in better BMW management
- 100 % Housekeeping staff and 94 % Nurses have undergone BMW training at the hospital. 98.3 % housekeeping staff have benefitted from BMW training.
- 92 % of nursing staff and 97% of HK staff correctly identified the biohazard symbol
- 58 % nurses have correct knowledge about solution for puncture proof container.
- 84 % nurses were aware that puncture proof container is to be used for disposal of sharp waste.
- 12 % of HK staff is not yet to be vaccinated for Hepatitis B / Tetanus or both whereas it is about 26 % in the case of nurses.
- The hospital is adhering to all guidelines of CPCB in respect of BMW handling Rules 2016 and amendment thereto in year 2018. Monthly reports and yearly reports are also being uploaded in its website regularly.

LIMITATION OF THE STUDY

Inspite of all out effort to make the study as precise and objective, few inescapable limitations are as under:-

- The study was limited to the nursing and Housekeeping staff. Doctors were not made or included in the study subject due to obvious reason.
- The method used was convenient sampling as all the nurses and housekeepers were not ready to fill the questionnaire. So only those who were willing were taken as a sample. However, necessary precaution in terms of selecting study population from all the departments/floors of the hospital was done to make the study result more representative and less biased.
- Study design was limited to test the awareness level on BMW and not compliance.

Recommendation

- In service training must continue to be given to both nursing and housekeeping staff for better BMW awareness.
- All nursing and housekeeping staff must be vaccinated for both Hepatitis B and Tetanus.
- The representative of CBMWTF who comes daily for collection of BMW must wear PPE, while handling waste.
- All bins color coding should be on the lines as promulgated by existing authorities.
- There may arise a need in future to relocate or extend the biomedical room. The present room size may not accommodate all big size trolleys when the BMW load may increase in future.
- The proper securing of the non chlorinated bags used for disposal of waste must be done properly at the source to avoid accidental spills during transportation and while it is being handled by the HK persons at BMW room.
- As on date there are number of large size green colour trolleys kept at biomedical room wherein BMW waste is stored according to the categories. These large trolleys have proper label of paper pasted for respective categories of BMW. Although the bags used from source for disposal of BMW are of correct color codes, it is recommended that trolleys kept at biomedical room for storage could also be as per color coding of BMW to avoid feasible confusion.

ANNEXURES:

1. Consent Form.

2. Questionnaire for nursing staff regarding biomedical waste.

3. Questionnaire for Housekeeping staff regarding biomedical waste.

ANNEXURE 1

AWARENESS ABOUT BIOMEDICAL WASTE IN NURSING AND HOUSEKEEPING STAFF, OF VENKATESHWAR HOSPITAL, DWARKA

Consent to take part in research

- I…….. Voluntarily AND willingly agree to participate in this research study.
- I understand that although I agree to participate now, however I can withdraw from the survey at any time or will refuse to answer any question without any consequences of any kind.
- I have got the purpose and natures of the study explained to me and also have had the opportunity to ask questions about the study.
- I understand that participation involves……[outline briefly in simple terms what participation in your research will involve].
- I understand that I will not get financially benefitted by participating in this research
- I understand that my response to questionnaire may be quoted in **dissertation, conference presentation, published papers by the researcher.**
- I understand that signed consent forms will be retained with **Lt Col Shyam Singh** and he can use it in his **PGDHM 2017-19 dissertations, until March 2019-June 2019 and in conference presentation, published papers.**
- I understand that the transcript of my interview/ response to questionnaire may be retained forever with **the researcher and in IIHMR New Delhi.**
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

NAME: Lt Col Shyam Singh

CONTACT DETAIL: 9958002994

---------- _____

Signature of participant **Date**

➢ I believe the participant is giving an informed consent to participate in this study.

---------- _____

Signature of researcher **Date**

ANNEXURE 2

QUESTIONNAIRE: AWARENESS OF NURSING STAFF ON BIOMEDICAL WASTE

NAME (Voluntarily): _____

Age:_____ Total Service at Hospital:_____

Tick the appropriate answer:

1. **Do you know what BMW is about?**

   ( ) Yes ( ) No

2. **Biomedical Waste includes?**

   ( ) Infectious & non-infectious waste of patient ( ) Infectious waste of patient ( ) Waste due to wear & tear of equipment

3. **Do you know about colour coding segregation of biomedical waste?**

   ( ) Yes ( ) No

4. **Different colour bags used in biomedical waste?**

   ( ) White, yellow, red, Blue ( ) Green, Red, Yellow, Black

   ( ) Grey, Red, Yellow, Blue

5. **Human anatomical waste and soiled dressing is segregated into which bin?**

   ( ) Yellow and Red respectively ( ) Blue ( ) Yellow

6. **Waste sharps has to be disposed into which baggage?**

   ( ) White ( ) Puncture proof container ( ) Red

7. **Puncture proof container contains which type of solution?**

   ( ) 2% Sodium hypo chloride ( ) 2% Magnesium chloride ( ) None

8. What are major risks of infection associated with hospital waste handling?

( ) AIDS, Hepatitis, TB,Typhoid fever ( ) Malaria, Diabetes, Psoriasis,

( ) Hypertension, cough and Sinusitis

9. Different types of disinfection methods used are

( ) Autoclave, Microwave, Hydroclave Chemical ( ) Only fumigation

( ) Using Disinfection fluid

10. Have you been vaccinated for Hepatitis B and tetanus?

( ) Both tetanus and Hepatitis B ( ) Hepatitis B only

( ) Tetanus only ( ) None

11. Which is the symbol used for Biomedical waste

( )  **( )**  **( )** 

13. What safety measure is taken if spill occurs?

( ) After cleaning with disinfectant, infected material is thrown in the designated bins.

( ) Cleaned without using disinfectant

14. Did you undergo any training on handling of BMW management at this hospital?

( ) Yes ( ) No

ANNEXURE 3

जैव चिकित्सा (बायोमेडीकल) : HOUSEKEEPING STAFF की जागरूकता पर प्रश्नावली

नाम (स्वेच्छा से): _____ **विभाग** _____
आयु:_____ **अस्पताल में कुल सेवा:**
_____

उचित उत्तर पर टिक करें:

1. क्या आप बायोमेडिकल कचरे (*वेस्ट*) के बारे में जानते हैं? ( ) हां ( ) नहीं

2. बायोमेडिकल कचरे में शामिल हैं:

( ) घरेलू कचरा ( ) खतरनाक कचरा

3. क्या आप बायोमेडिकल कचरे के रंग कोडिंग अलगाव के बारे में जानते हैं? ( ) हां ( ) नहीं

4. बायोमेडिकल *वेस्ट* में इस्तेमाल किए जाने वाले विभिन्न रंग के बैग होते हैं:-

( ) काला, लाल, पीला, नीला ( ) हरा, लाल, पीला, काला ( ) सफेद, पीला, लाल, नीला

5. क्या आपको हेपेटाइटिस बी और *टिटनेस* का टीका लगाया गया है?

( ) हेपेटाइटिस बी और *टिटनेस* दोनों का ( ) केवल हेपेटाइटिस बी
( ) केवल *टिटनेस* का ( ) कोई नहीं

6. HYPERLINK "http://www.hindi2dictionary.com/%E0%A4%A6%E0%A5%82%E0%A4%B7%E0%A4%B

( )  ( )  ( ) 

7. बायोमेडिकल कचरे पर काम करते समय सबसे पहले निम्नलिखित में से किसका उपयोग किया जाना चाहिए?

( ) मास्क ( ) कैप ( ) दस्ताने ( ) उपरोक्त सभी

8. सुई छड़ी की चोट किसी भी संक्रमण का कारण बन सकती है:

( ) हा ( ) नहीं

9. बायोमेडिकल कचरे को ले जाते समय भीड़ वाले क्षेत्रों से बचा जाना चाहिए?

( ) हां ( ) नहीं

10. क्या इस अस्पताल में बायोमेडिकल कचरे से निपटने के लिए आप को कोई प्रशिक्षण दिया गया है?

( ) हां ( ) नहीं

11. क्या आपको लगता है कि बायोमेडिकल कचरे के बारे में ज्ञान प्रदान करने में प्रशिक्षण कार्यक्रम प्रभावी है?

( ) हां ( ) नहीं

ह
□□
□□
□□षर

BIBLIOGRAPHY

1. Venketeshwar Hospital official website (www.venketeshwarhospitals.com).
2. Shalini Sharma.et.al.,(2010).International journal of environment science and development,1(3).p.264) http:// epa.gov.ebtpages/waste.medical.html
3. Vijaykumar Goddu.et.al, (2007) International Journal of Health Sciences and research.
4. **Sinha.N (2008)**
5. WHO: Safe management of wastes from healthcare activities. 1995. p.25-26 published in www.medvarisity.com/ejournals/leena
6. Bio-Medical Waste Management Rules, 2016.
7. Bio-Medical Waste Management (Amendment) Rules, 2018.
8. Central Pollution Control Board, Revised Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities published on 21 December 2016.
9. www.who.int –Blue book (Revised).
10. BMW management in India –Review article by Athar Hussain, Shivani Gupta, Sanjay Kumar Koli published at Vol No 07, special issue No 1, February 2018 in www.ijarse.com.
11. Journal medical waste disposal in Mpumalanga province, South Africa- Implication for training of healthcare professionals by RR Makhura, SF Matlala and MP Kekune.
12. Datta P, Mohi GK, Chander J (2018) articles on critical appraisal study on Biomedical waste management in India published on J Lab Physicians 2018;10:6- (http://www.jlponline.org)

13. Pandit NB, Mehta HK, Kartha GP, Chowdhary SK. Management study of bio-medical waste awareness and practises in a district of Gujarat published in Indian Journal of Public Health in October-December 2005. 49(4).p.25-27) .

14. S. Muhammad Salim Khan, Sheikh Mohd Saleem, Mohsina Mukhtar.et al., study on biomedical waste management practices at a paediatric tertiary care hospital of Kashmir valley published in Indian Journal of Forensic and Community Medicine, in October-December, 2018;5(4):231-235.

Lt. Col. Shyam Singh D Report

ORIGINALITY REPORT

8%	6%	2%	7%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	trap.ncirl.ie Internet Source	1%
2	Submitted to International Health Sciences University Student Paper	1%
3	www.science.gov Internet Source	<1%
4	www.tcd.ie Internet Source	<1%
5	123.49.46.157 Internet Source	<1%
6	repository.uinjkt.ac.id Internet Source	<1%
7	drbhavdeep.com Internet Source	<1%
8	Renju Rajan, Delvin T. Robin, Vandanarani M.. "Biomedical waste management in Ayurveda hospitals – current practices & future prospectives", Journal of Ayurveda and	<1%

	Integrative Medicine, 2018 Publication	
9	Submitted to BLDE University Student Paper	<1%
10	Submitted to National Law School of India University, Bangalore Student Paper	<1%
11	Submitted to University of West London Student Paper	<1%
12	jpps.juw.edu.pk Internet Source	<1%
13	Submitted to Griffth University Student Paper	<1%
14	inclentrust.org Internet Source	<1%
15	lup.lub.lu.se Internet Source	<1%
16	www.rguhs.ac.in Internet Source	<1%
17	Submitted to University of Melbourne Student Paper	<1%
18	bh.wikipedia.org Internet Source	<1%
	cpcb.nic.in	

19	Internet Source	<1%
20	www.moef.nic.in Internet Source	<1%
21	desthp.nic.in Internet Source	<1%
22	www.pubfacts.com Internet Source	<1%
23	Submitted to Savitribai Phule Pune University Student Paper	<1%
24	Submitted to Trinity College Dublin Student Paper	<1%
25	citeseerx.ist.psu.edu Internet Source	<1%
26	wii.gov.in Internet Source	<1%
27	Siddharudha Shivalli, Vasudha Sanklapur. "Healthcare Waste Management: Qualitative and Quantitative Appraisal of Nurses in a Tertiary Care Hospital of India", The Scientific World Journal, 2014 Publication	<1%
28	www.healthcare-waste.org Internet Source	<1%

29	Submitted to University of Bedfordshire Student Paper	<1%
30	Submitted to IIHMR University Student Paper	<1%
31	Submitted to Amity University Student Paper	<1%
32	Submitted to Universiti Teknologi MARA Student Paper	<1%
33	Maganur Lakshmana Kusuma, Ranjini N, Anitha K T, Muddasir Azeez Khan, Mansoor Ahmed. "BIO MEDICAL WASTE MANAGEMENT: AN INTERVENTIONAL STUDY AMONG NURSING STAFF IN TERITIARY CARE HOSPITAL OF MYSORE", Journal of Evolution of Medical and Dental Sciences, 2015 Publication	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		