

March 2017

# Bio-medical Waste Inventorization of Healthcare Units

FINAL REPORT

STUDY AREA: ARAVALLI DISTRICT

Submitted to:

Gujarat Environment Management Institute  
(An Autonomous Institute of Government of Gujarat)

Prepared and Submitted by:

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## **ACKNOWLEDGMENT**

**Dr. K.P. Patel**

**Principal**

**Sir P.T. Science College, Modasa**



Since 1968, the college has been bifurcated into two separate independent units and the present Sir P.T. Science College came into being afresh. The college, at present has physical, inner and psychic energy potentials required for any Academic Organization. Generally, the scenario of education lacks the understanding of the deeper layers of our reality. The system of education has been strong on the externals, weak on the internals. But, as an academic institution, I dare say, we have a positive attitude to experimentation and innovation. We encourage improved teaching learning practices. We appreciate an overgrowing sensitivity to community and global concerns.

Bio- Medical Waste Management is a crucial challenge faced by all hospitals and health centres which lead to become major issue for environment. We present this report on “Biomedical waste inventorization of Aravalli District”, as a step towards sensitizing the hospital professionals and support staff and Society on management of bio-medical waste. This Report is the result of sincere and hard work of all the team members.

We are grateful to Gujarat Environment Management Institute (GEMI), Gandhinagar for sponsoring this project and showing faith in my entire team to undertake the task of preparing this report.

**Dr. Rajendrasinh H Parmar**

**Project Coordinator**



We are happy to submit the report of **“BIOMEDICAL WASTE INVENTORIZAZION OF ARAVALLI DISTRICT”**, all type health centre of Arvalli district, Gujarat. The work of **“BIOMEDICAL WASTE INVENTORIZAZION OF ARAVALLI DISTRICT”**, of Arvalli district, Gujarat, given by the agency of Gujarat Environment Management Institute (GEMI) to our Sir P T Science College, managed by The M L Gandhi Higher Education Society, Modasa, Arvalli district, Gujarat during the year 2016-17. This survey is completed under the guidance of our college Principal Dr. K P Patel and I/C Prin. & Head of the Department of Biology Dr. S D Vediya. For this project work, we form the committee under my coordination. Three other member in this committee are Dr. Shailesh V Patel, Associate professor in Chemistry, Prof Girish L Vekaria, Assistant Professor in Physics, Dr. Nilesh C Vachhani, Assistant professor in Zoology department and Shi Kamesh B Shah, Laboratory Assistant in Chemistry. Aravalli district having six taluka Modasa, Bayed, Bhiloda, Meghraj and Malpur. Each taluka having number of villages 676 Most of them are very interior. So to complete the survey was very difficult and more timing even though we were distributed work between our committee members in such a way that project work will complete within time as per taluka. We involve college student for the survey of this project work to finish smoothly. Our students including girls actively participated in this work. During this project work students and all our committee member benefited to interact with medical officers, laboratory technicians and other staff which are engaged with different health centre. We presented our work in this report as per Performa suggested by GEMI. Here we very much thankful to GEMI who has gave opportunity to Students to study the Environmental challenges in this field. I also thankful to our college principal Dr K P Patel, all committee members and volunteers students who were engaged with this project work actively participated.

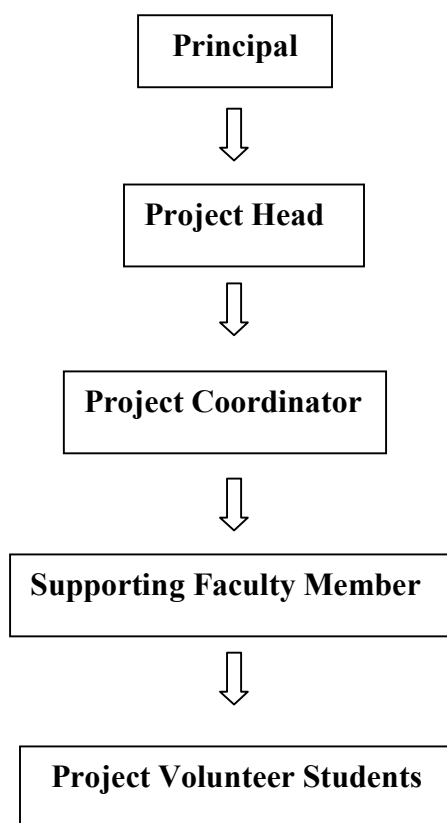
Coordinator

Dr. Rajendrasinh H Parmar

(Associate professor, Sir P T Science College, Modasa)

**“BIOMEDICAL WASTE INVENTORIZAZION OF ARAVALLI DISTRICT”,  
PROJECT TEAM**

**DETAILS OF MANPOWER: ORGANOGRAM**



**List of Team (Faculty)**

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7	Shri Kamesh B. Shah	Member	9429041814

## List of Student's Team (Girls)

No	Name	Taluka	M.no.	Roll No.
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4	Prajapati Janvi Satishbhai	BHILODA	9408984011	3064
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6	Katara Zahal Naginbhai	BHILODA	9428832914	3025
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9	Prajapati Nidhi Bharatbhai	DHANSURA	9898873364	3154
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## **Abbreviations**

**APCD - Air Pollution Control Device**

**BMWM Rules - Bio-medical Waste Management Rules**

**CBWTF - Common Bio-medical Waste Treatment and Disposal Facility**

**CO - Carbon Monoxide**

**CO<sub>2</sub> - Carbon Dioxide**

**DG - Diesel Generator**

**EC - Environmental Clearance**

**EIA - Environment Impact Assessment**

**ETP - Effluent Treatment Plant**

**GPCB - Gujarat Pollution Control Board**

**GPS - Global Positioning System**

**HCFs - Health Care Facilities**

**HCU - Health Care Unit**

**MoU - Memorandum of Understanding**

**NABL - National Accreditation Board for Testing and Laboratories**

**NO<sub>x</sub> - Oxides of Nitrogen**

**O<sub>2</sub> - Oxygen**

**PCC - Pollution Control Committee**

**PLC - Programmable Logical Control**

**SEIAA - State Environment Impact Assessment Authority**

**SLF - Secured Landfill**

**TSDF - Treatment Storage and Disposal Facility**

**TOC - Total Organic Carbon**

**VOCs - Volatile Organic Compounds**

## CHAPTER 1

### INTRODUCTION TO BIO-MEDICAL WASTE

Biomedical waste management has recently emerged as an issue of major concern not only to hospitals, nursing home authorities but also to the environment. The bio-medical wastes generated from health care units depend upon a number of factors such as waste management methods, type of health care units, occupancy of healthcare units, specialization of healthcare units, ratio of reusable items in use, availability of infrastructure and resources etc.

The proper management of biomedical waste has become a worldwide humanitarian topic today. Although hazards of poor management of biomedical waste have aroused the concern world over, especially in the light of its far-reaching effects on human, health and the environment.

Now it is a well established fact that there are many adverse and harmful effects to the environment including human beings which are caused by the “Hospital waste” generated during the patient care. Hospital waste is a potential health hazard to the health care workers, public and flora and fauna of the area. The problems of the waste disposal in the hospitals and other health-care institutions have become issues of increasing concern.

The Bio-Medical Waste (Management and Handling) Rules, 1998 are conferred by section 6, 8, 25 of the Environment (Protection) Act, 1986 (29 of 1986).

In India, the Bio-medical Waste (Management and Handling) Rules, 1998 and further amendments were passed for the regulation of bio-medical waste management. On 28th Mar 2016 Biomedical Waste Management Rules, 2016 were also notified by Central Govt. Each state's Pollution Control Board or Pollution control Committee will be responsible for implementing the new legislation.

#### SOURCES OF BIOMEDICAL WASTE

Hospitals produce waste, which is increasing over the years in its amount and type. The hospital waste, in addition to the risk for patients and personnel who handle them also poses a threat to public health and environment.

##### Major Sources

- ❖ Govt. hospitals/private hospitals/nursing homes/ dispensaries.
- ❖ Primary health centres.
- ❖ Medical colleges and research centres/ paramedic services.

- ❖ Veterinary colleges and animal research centres.
- ❖ Blood banks/mortuaries/autopsy centres.
- ❖ Biotechnology institutions.
- ❖ Production units.

### **Minor Sources**

- ❖ Physicians/ dentists' clinics
- ❖ Animal houses/slaughter houses.
- ❖ Blood donation camps.
- ❖ Vaccination centres.
- ❖ Acupuncturists/psychiatric clinics/cosmetic piercing.
- ❖ Funeral services.
- ❖ Institutions for disabled persons

### **ADVERSE EFFECTS**

A major issue related to current Bio-Medical waste management in many hospitals is that the implementation of Bio-Waste regulation is unsatisfactory as some hospitals are disposing of waste in a haphazard, improper and indiscriminate manner. Lack of segregation practices results in mixing of hospital wastes with general waste making the whole waste stream hazardous. Inappropriate segregation ultimately results in an incorrect method of waste disposal.

Disposal of this waste is an environmental concern, as many medical wastes are classified as infectious or bio hazardous and could potentially lead to the spread of infectious disease. The most common danger for humans is the infection which also affects other living organisms in the region. Daily exposure to the waste (landfill) leads to accumulation of harmful substances or microbes in the person's body.

Biomedical waste may pose an injury and exposure risks via occupational contact with medical waste for doctors, nurses, janitorial, laundry and refuse workers. Further, there are opportunities for the general public to come into contact with medical waste, such as needles, used illicitly outside healthcare settings or biomedical waste generated via home health care.

### 1.3. CLASSIFICATION OF BMW

**Table 1.1 Classification of Bio-medical Waste**

Category	Type of waste	Type of bag or container	Treatment and disposal option
Yellow	Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).	Yellow coloured non-chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial.
	<b>Animal Anatomical Waste</b> : Experimental animal carcasses, body parts, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.		
	<b>Soiled Waste:</b> Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.		Incineration or Plasma Pyrolysis or deep burial. In absence of above facilities, autoclaving or micro-waving/hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery.
	<b>Expired or Discarded Medicines:</b> Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.	Yellow coloured non-chlorinated plastic bags or containers	Expired cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature $>1200^{\circ}\text{C}$ or to common bio - medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at $>1200$

			<sup>0</sup> C Or Encapsulation or Plasma Pyrolysis at >1200 <sup>0</sup> C All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.
	<b>Chemical Waste:</b> Chemicals used in production of biological and used or discarded disinfectants.	Yellow coloured containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility .
	<b>Chemical Liquid Waste :</b> Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X - ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids , liquid from laboratories and floor washings, cleaning, house - keeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre - treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule - III.
	Discarded linen, mattresses, beddings contaminated with blood or body fluid.	Non-chlorinated yellow plastic bags or suitable packing material	Non - chlorinated chemical disinfection followed by incineration or Plazma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or Plazma Pyrolysis .
	<b>Microbiology, Biotechnology and other clinical laboratory waste:</b> Blood bags, Laboratory cultures, stocks or specimens of micro - organisms, live or attenuated vaccines, human and animal	Autoclave safe plastic bags or containers	Pre - treat to sterilize with non - chlorinated chemicals on - site as per National AIDS Control Organisation

	cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.		or World Health Organisation guidelines thereafter for Incineration.
Red	Contaminated Waste (Recyclable) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes ) and vacutainers with their needles cut) and gloves.	Red coloured non-chlorinated plastic bags or containers	Autoclaving or micro - waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.
White (Translucent)	<b>Waste sharps including Metals:</b> Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps	Puncture proof, Leak proof, tamper proof containers	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Board s or Pollution Control Committee s) or sanitary landfill or designated concrete waste sharp pit.
Blue	<b>Glassware:</b> Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes	Cardboard boxes with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite

			treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.

(Source: BMW Rules, 2016)

## BIOMEDICAL WASTE MANAGEMENT PROCESS

There is a big network of Health Care Institutions in India. The hospital waste like body parts, organs, tissues, blood and body fluids along with soiled linen, cotton, bandage and plaster casts from infected and contaminated areas are very essential to be properly collected, segregated, stored, transported, treated and disposed of in safe manner to prevent nosocomial or hospital acquired infection.

1. Waste collection
2. Segregation
3. Transportation and storage
4. Treatment & Disposal
5. Transport to final disposal site
6. Final disposal

## BIOMEDICAL WASTE TREATMENT AND DISPOSAL

Health care waste is a heterogeneous mixture, which is very difficult to manage as such. But the problem can be simplified and its dimension reduced considerably if a proper management system is planned.

## INCINERATION TECHNOLOGY

This is a high temperature thermal process employing combustion of the waste under controlled condition for converting them into inert material and gases. Incinerators can be oil fired or electrically powered or a combination thereof. Broadly, three types of incinerators are used for hospital waste: multiple hearth type, rotary kiln and controlled air types. All the types can have

primary and secondary combustion chambers to ensure optimal combustion. These are refractory lined.

## **NON-INCINERATION TECHNOLOGY**

Non-incineration treatment includes four basic processes: thermal, chemical, irradiative, and biological. The majority of non-incineration technologies employ the thermal and chemical processes. The main purpose of the treatment technology is to decontaminate waste by destroying pathogens. Facilities should make certain that the technology could meet state criteria for disinfection.

### **AUTOCLAVING**

- The autoclave operates on the principle of the standard pressure cooker.
- The process involves using steam at high temperatures.
- The steam generated at high temperature penetrates waste material and kills all the micro organism
- These are also of three types: Gravity type, Pre-vacuum type and Retort type.

In the first type (Gravity type), air is evacuated with the help of gravity alone. The system operates with temperature of 121 deg. C. and steam pressure of 15 psi. for 60-90 minutes. Vacuum pumps are used to evacuate air from the Pre vacuum autoclave system so that the time cycle is reduced to 30-60 minutes. It operates at about 132 deg. C. Retort type autoclaves are designed much higher steam temperature and pressure. Autoclave treatment has been recommended for microbiology and biotechnology waste, waste sharps, soiled and solid wastes. This technology renders certain categories (mentioned in the rules) of bio-medical waste innocuous and unrecognizable so that the treated residue can be land filled.

### **MICROWAVE IRRADIATION**

- The microwave is based on the principle of generation of high frequency waves.
- These waves cause the particles within the waste material to vibrate, generating heat.
- This heat generated from within kills all pathogens.



## **CHEMICAL METHODS**

- 1 % hypochlorite solution can be used for chemical disinfection

## **PLASMA PYROLYSIS**

Plasma pyrolysis is a state-of-the-art technology for safe disposal of medical waste. It is an environment-friendly technology, which converts organic waste into commercially useful byproducts. The intense heat generated by the plasma enables it to dispose all types of waste including municipal solid waste, biomedical waste and hazardous waste in a safe and reliable manner. Medical waste is pyrolysed into CO, H<sub>2</sub>, and hydrocarbons when it comes in contact with the plasma-arc. These gases are burned and produce a high temperature (around 1200°C).

### **1.5. CHALLENGES IN BIO-MEDICAL WASTE MANAGEMENT**

In India, there are a number of different disposal methods. For example, if body fluids are present, the material needs to be incinerated or put into an autoclave. Although this is the proper method, most medical facilities fail to follow the regulations. It is often found that biomedical waste is put into the ocean, where it eventually washes up on shore or in landfills due to improper sorting done in the medical facility. Improper disposal can lead to many diseases in animals as well as humans. For example, animals, such as cows in Pondicherry, India, are consuming the infected waste and eventually, these infections can be transported to humans.

A major issue related to current Bio-Medical waste management in many hospitals is that the implementation of Bio-Waste regulation is unsatisfactory as some hospitals are disposing of waste in a haphazard, improper and indiscriminate manner. Lack of segregation practices, results in mixing of hospital wastes with general waste making the whole waste stream hazardous. Inappropriate segregation ultimately results in an incorrect method of waste disposal.

Inadequate Bio-Medical waste management thus will cause environmental pollution, unpleasant smell, growth and multiplication of vectors like insects, rodents and worms and may lead to the transmission of diseases like typhoid, cholera, hepatitis and AIDS through injuries from syringes and needles contaminated with human.

Various communicable diseases which spread through water, sweat, blood, body fluids and contaminated organs should be prevented. The Bio Medical Waste scattered in and around the hospitals invites flies, insects, rodents, cats and dogs that are responsible for the spread of communication diseases like plague and rabies. Rag pickers in the hospital, sorting out the garbage are at a risk of getting tetanus and HIV infections. The recycling of disposable syringes, needles, IV sets and other article like glass bottles without proper sterilization are responsible for Hepatitis, HIV, and other viral diseases. It becomes primary responsibility of Health administrators to manage hospital waste in most safe and eco-friendly manner.

The problem of bio-medical waste disposal in the hospitals and other healthcare establishments has become an issue of increasing concern, prompting hospital administration to seek new ways of scientific, safe and cost effective management of the waste and keeping their personnel informed about the advances in this area. The need of proper hospital waste management system is of prime importance and is an essential component of quality assurance in hospitals

#### **1.6 OBJECTIVE OF THE PROJECT**

- To prepare a detailed category wise inventory of the bio-medical waste generated within HCU's of Aravalli district. (only for Modasa, Meghraj, Malpur, Dhansura, Bayad and Bhiloda Taluka)
- To classify the waste as per different categories according to Bio-medical Waste Rules, 2016.
- To identify, study and document the current waste handling, management, and treatment and disposal practices.
- To submit a comprehensive report.

#### **1.7 SCOPE OF THE WORK**

- Preparation of list of Health Care Units (HCUs) as per Bio-medical Waste Rules, within the district
- Conducting an on-field (physical) survey of the HCUs as per the questionnaire provided by GEMI.
- Analysis of the survey in excel sheet format.
- To identify, study and document the current waste handling, management, and treatment and disposal practices.
- Generate the report as per the format provided by GEMI.

## CHEPTER 2

### LEGAL FRAMEWORK (ABOUT BIO-MEDICAL WASTE RULES, 2016)

**G.S.R. 343(E).**-Whereas the Bio-Medical Waste (Management and Handling) Rules, 1998 was published *vide* notification number S.O. 630 (E) dated the 20th July, 1998, by the Government of India in the erstwhile Ministry of Environment and Forests, provided a regulatory frame work for management of bio-medical waste generated in the country;

And whereas, to implement these rules more effectively and to improve the collection, segregation, processing, treatment and disposal of these bio-medical wastes in an environmentally sound management thereby, reducing the bio- medical waste generation and its impact on the environment, the Central Government reviewed the existing rules;

And whereas, in exercise of the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government published the draft rules in the Gazette *vide* number G.S.R. 450 (E), dated the 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date on which copies of the Gazette containing the said notification were made available to the public;

And whereas, the copies of the Gazette containing the said draft rules were made available to the public on the 3rd June, 2015;

And whereas, the objections or comments received within the specified period from the public in respect of the said draft rules have been duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by section 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), and in supersession of the Bio-Medical Waste (Management and Handling) Rules, 1998, except as respects things done or omitted to be done before such suppression, the Central Government hereby makes the following rules, namely:-

#### **1. Short title and commencement.-**

- (1) these rules may be called the Bio-Medical Waste Management Rules, 2016.
- (2) They shall come into force on the date of their publication in the Official Gazette.

#### **2. Application.-**

- (1) These rules shall apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, ayush

hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs.

(2) These rules shall not apply to,-

(a) Radioactive wastes as covered under the provisions of the Atomic Energy Act, 1962(33 of 1962) and the rules made there under;

(b) Hazardous chemicals covered under the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 made under the Act;

(c) Solid wastes covered under the Municipal Solid Waste (Management and Handling) Rules, 2000 made under the Act;

(d) The lead acid batteries covered under the Batteries (Management and Handling) Rules, 2001 made under the Act;

(e) Hazardous wastes covered under the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 made under the Act;

(f) Waste covered under the e-Waste (Management and Handling) Rules, 2011 made under the Act; and

(g) Hazardous micro organisms, genetically engineered micro organisms and cells covered under the Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms, Genetically Engineered Micro organisms or Cells Rules, 1989 made under the Act.

**3. Definitions.-** In these rules, unless the context otherwise requires, -

(a) "Act" means the Environment (Protection) Act, 1986 (29 of 1986);

(b) "animal house" means a place where animals are reared or kept for the purpose of experiments or testing;

(c) "authorization" means permission granted by the prescribed authority for the generation, collection, reception, storage, transportation, treatment, processing, disposal or any other form of handling of bio-medical waste in accordance with these rules and guidelines issued by the Central Government or Central Pollution Control Board as the case may be;

(d) "authorised person" means an occupier or operator authorised by the prescribed authority to generate, collect, receive, store, transport, treat, process, dispose or handle bio-medical waste in accordance with these rules and the guidelines issued by the Central Government or the Central Pollution Control Board, as the case may be;

- (e) "biological" means any preparation made from organisms or micro-organisms or product of metabolism and biochemical reactions intended for use in the diagnosis, immunisation or the treatment of human beings or animals or in research activities pertaining thereto;
- (f) "bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to these rules;
- (g) "bio-medical waste treatment and disposal facility" means any facility wherein treatment, disposal of bio-medical waste or processes incidental to such treatment and disposal is carried out, and includes common bio-medical waste treatment facilities;
- (h) "Form" means the Form appended to these rules;
- (i) "handling" in relation to bio-medical waste includes the generation, sorting, segregation, collection, use, storage, packaging, loading, transportation, unloading, processing, treatment, destruction, conversion, or offering for sale, transfer, disposal of such waste;
- (j) "health care facility" means a place where diagnosis, treatment or immunisation of human beings or animals is provided irrespective of type and size of health treatment system, and research activity pertaining thereto;
- (k) "major accident" means accident occurring while handling of bio-medical waste having potential to affect large masses of public and includes toppling of the truck carrying bio-medical waste, accidental release of bio-medical waste in any water body but exclude accidents like needle prick injuries, mercury spills;
- (l) "management" includes all steps required to ensure that bio- medical waste is managed in such a manner as to protect health and environment against any adverse effects due to handling of such waste;
- (m) "occupier" means a person having administrative control over the institution and the premises generating bio-medical waste, which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank, health care facility and clinical establishment, irrespective of their system of medicine and by whatever name they are called;
- (n) "operator of a common bio-medical waste treatment facility" means a person who owns or controls a Common Bio-medical Waste Treatment Facility (CBMWTF) for the collection,

reception, storage, transport, treatment, disposal or any other form of handling of bio-medical waste;

(o) "prescribed authority" means the State Pollution Control Board in respect of a State and Pollution Control Committees in respect of an Union territory;

(p) "Schedule" means the Schedule appended to these rules.

**4. Duties of the Occupier.-** It shall be the duty of every occupier to-

(a) take all necessary steps to ensure that bio-medical waste is handled without any adverse effect to human health and the environment and in accordance with these rules;

(b) make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste in colored bags or containers in the manner as specified in Schedule I, to ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals and the bio-medical waste from such place or premises shall be directly transported in the manner as prescribed in these rules to the common bio-medical waste treatment facility or for the appropriate treatment and disposal, as the case may be, in the manner as prescribed in Schedule I;

(c) pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilisation on-site in the manner as prescribed by the World Health Organisation (WHO) or National AIDs Control Organisation (NACO) guidelines and then sent to the common bio-medical waste treatment facility for final disposal;

(d) phase out use of chlorinated plastic bags, gloves and blood bags within two years from the date of notification of these rules;

(e) dispose of solid waste other than bio-medical waste in accordance with the provisions of respective waste management rules made under the relevant laws and amended from time to time;

(f) not to give treated bio-medical waste with municipal solid waste;

(g) provide training to all its health care workers and others, involved in handling of bio medical waste at the time of induction and thereafter at least once every year and the details of training programmes conducted, number of personnel trained and number of personnel not undergone any training shall be provided in the Annual Report;

(h) immunise all its health care workers and others, involved in handling of bio-medical waste for protection against diseases including Hepatitis B and Tetanus that are likely to be transmitted

- by handling of bio-medical waste, in the manner as prescribed in the National Immunisation Policy or the guidelines of the Ministry of Health and Family Welfare issued from time to time;
- (i) establish a Bar- Code System for bags or containers containing bio-medical waste to be sent out of the premises or place for any purpose within one year from the date of the notification of these rules;
  - (j) ensure segregation of liquid chemical waste at source and ensure pre-treatment or neutralization prior to mixing with other effluent generated from health care facilities;
  - (k) ensure treatment and disposal of liquid waste in accordance with the Water (Prevention and Control of Pollution) Act, 1974 ( 6 of 1974);
  - (l) ensure occupational safety of all its health care workers and others involved in handling of biomedical waste by providing appropriate and adequate personal protective equipments;
  - (m) conduct health check up at the time of induction and at least once in a year for all its health care workers and others involved in handling of bio- medical waste and maintain the records for the same;
  - (n) maintain and update on day to day basis the bio-medical waste management register and display the monthly record on its website according to the bio-medical waste generated in terms of category and colour coding as specified in Schedule I;
  - (o) report major accidents including accidents caused by fire hazards, blasts during handling of biomedical waste and the remedial action taken and the records relevant thereto, (including nil report) in Form I to the prescribed authority **and also** along with the annual report;
  - (p) make available the annual report on its web-site and all the health care facilities shall make own website within two years from the date of notification of these rules;
  - (q) inform the prescribed authority immediately in case the operator of a facility does not collect the bio-medical waste within the intended time or as per the agreed time;
  - (r) establish a system to review and monitor the activities related to bio-medical waste management, either through an existing committee or by forming a new committee and the Committee shall meet once in every six months and the record of the minutes of the meetings of this committee shall be submitted along with the annual report to the prescribed authority and the healthcare establishments having less than thirty beds shall designate a qualified person to review and monitor the activities relating to bio-medical waste management within that establishment and submit the annual report;
  - (s) maintain all record for operation of incineration, hydro or autoclaving etc., for a period of five

years;

(t) existing incinerators to achieve the standards for treatment and disposal of bio-medical waste as specified in Schedule II for retention time in secondary chamber and Dioxin and Furans within two years from the date of this notification.

#### **5. Duties of the operator of a common bio-medical waste treatment and disposal facility.-**

It shall be the duty of every operator to -

- (a) take all necessary steps to ensure that the bio-medical waste collected from the occupier is transported, handled, stored, treated and disposed of, without any adverse effect to the human health and the environment, in accordance with these rules and guidelines issued by the Central Government or, as the case may be, the central pollution control board from time to time;
- (b) ensure timely collection of bio-medical waste from the occupier as prescribed under these rules;
- (c) establish bar coding and global positioning system for handling of bio- medical waste within one year;
- (d) inform the prescribed authority immediately regarding the occupiers which are not handing over the segregated bio-medical waste in accordance with these rules;
- (e) provide training for all its workers involved in handling of bio-medical waste at the time of induction and at least once a year thereafter;
- (f) assist the occupier in training conducted by them for bio-medical waste management;
- (g) undertake appropriate medical examination at the time of induction and at least once in a year and immunise all its workers involved in handling of bio-medical waste for protection against diseases, including Hepatitis B and Tetanus, that are likely to be transmitted while handling bio-medical waste and maintain the records for the same;
- (h) ensure occupational safety of all its workers involved in handling of bio-medical waste by providing appropriate and adequate personal protective equipment;
- (i) report major accidents including accidents caused by fire hazards, blasts during handling of biomedical waste and the remedial action taken and the records relevant thereto, (including nil report) in Form I to the prescribed authority **and also** along with the annual report;
- (i) maintain a log book for each of its treatment equipment according to weight of batch; categories of waste treated; time, date and duration of treatment cycle and total hours of operation;



(k) allow occupier , who are giving waste for treatment to the operator, to see whether the treatment is carried out as per the rules;

(l) shall display details of authorisation, treatment, annual report etc on its web-site;

(m) after ensuring treatment by autoclaving or microwaving followed by mutilation or shredding, whichever is applicable, the recyclables from the treated bio-medical wastes such as plastics and glass, shall be given to recyclers having valid consent or authorisation or registration from the respective State Pollution Control Board or Pollution Control Committee;

(n) supply non-chlorinated plastic coloured bags to the occupier on chargeable basis, if required;

(o) common bio-medical waste treatment facility shall ensure collection of biomedical waste on holidays also;

(p) maintain all record for operation of incineration, hydroor autoclaving for a period of five years; and

(q) upgrade existing incinerators to achieve the standards for retention time in secondary chamber and

Dioxin and Furans within two years from the date of this notification.

**6. Duties of authorities.-**The Authority specified in column (2) of Schedule-III shall perform the duties as specified in column (3) thereof in accordance with the provisions of these rules.

### **7. Treatment and disposal.-**

(1) Bio-medical waste shall be treated and disposed of in accordance with Schedule I, and in compliance with the standards provided in Schedule-II by the health care facilities and common bio-medical waste treatment facility.

(2) Occupier shall hand over segregated waste as per the Schedule-I to common bio-medical waste treatment facility for treatment, processing and final disposal:

Provided that the lab and highly infectious bio-medical waste generated shall be pre-treated by equipment like autoclave or microwave.

(3) No occupier shall establish on-site treatment and disposal facility, if a service of ` common biomedical waste treatment facility is available at a distance of seventy-five kilometer.

(4) In cases where service of the common bio-medical waste treatment facility is not available, the Occupiers shall set up requisite biomedical waste treatment equipment like incinerator, autoclave or microwave, shredder prior to commencement of its operation, as per the authorisation given by the prescribed authority.

(5) Any person including an occupier or operator of a common bio medical waste treatment facility, intending to use new technologies for treatment of bio medical waste other than those listed in Schedule I shall request the Central Government for laying down the standards or operating parameters.

(6) On receipt of a request referred to in sub-rule (5), the Central Government may determine the standards and operating parameters for new technology which may be published in Gazette by the Central Government.

(7) Every operator of common bio-medical waste treatment facility shall set up requisite biomedical waste treatment equipments like incinerator, autoclave or microwave, shredder and effluent treatment plant as a part of treatment, prior to commencement of its operation.

(8) Every occupier shall phase out use of non-chlorinated plastic bags within two years from the date of publication of these rules and after two years from such publication of these rules, the chlorinated plastic bags shall not be used for storing and transporting of bio-medical waste and the occupier or operator of a common bio-medical waste treatment facility shall not dispose of such plastics by incineration and the bags used for storing and transporting biomedical waste shall be in compliance with the Bureau of Indian Standards. Till the Standards are published, the carry bags shall be as per the Plastic Waste Management Rules, 2011.

(9) After ensuring treatment by autoclaving or microwaving followed by mutilation or shredding, whichever is applicable, the recyclables from the treated bio-medical wastes such as plastics and glass shall be given to such recyclers having valid authorisation or registration from the respective prescribed authority.

(10) The Occupier or Operator of a common bio-medical waste treatment facility shall maintain a record of recyclable wastes referred to in sub-rule (9) which are auctioned or sold and the same shall be submitted to the prescribed authority as part of its annual report. The record shall be open for inspection by the prescribed authorities.

(11) The handling and disposal of all the mercury waste and lead waste shall be in accordance with the respective rules and regulations.

**8. Segregation, packaging, transportation and storage.**-(1) No untreated bio-medical waste shall be mixed with other wastes.

(2) The bio-medical waste shall be segregated into containers or bags at the point of generation in accordance with Schedule I prior to its storage, transportation, treatment and disposal.

(3) The containers or bags referred to in sub-rule (2) shall be labeled as specified in Schedule IV.

(4) Bar code and global positioning system shall be added by the Occupier and common bio-medical waste treatment facility in one year time.

(5) The operator of common bio-medical waste treatment facility shall transport the bio-medical waste from the premises of an occupier to any off-site bio-medical waste treatment facility only in the vehicles having label as provided in part 'A' of the Schedule IV along with necessary information as specified in part 'B' of the Schedule IV.

(6) The vehicles used for transportation of bio-medical waste shall comply with the conditions if any stipulated by the State Pollution Control Board or Pollution Control Committee in addition to the requirement contained in the Motor Vehicles Act, 1988 (59 of 1988), if any or the rules made there under for transportation of such infectious waste.

(7) Untreated human anatomical waste, animal anatomical waste, soiled waste and, biotechnology waste shall not be stored beyond a period of forty –eight hours:

Provided that in case for any reason it becomes necessary to store such waste beyond such a period, the occupier shall take appropriate measures to ensure that the waste does not adversely affect human health and the environment and inform the prescribed authority along with the reasons for doing so.

(8) Microbiology waste and all other clinical laboratory waste shall be pre-treated by sterilisation to Log 6 or disinfection to Log 4, as per the World Health Organisation guidelines before packing and sending to the common bio-medical waste treatment facility.

**9. Prescribed authority.**-(1) The prescribed authority for implementation of the provisions of these rules shall be the State Pollution Control Boards in respect of States and Pollution Control Committees in respect of Union territories.

(2) The prescribed authority for enforcement of the provisions of these rules in respect of all health care establishments including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories and blood banks of the Armed Forces under the Ministry of Defence shall be the Director General, Armed Forces Medical Services, who shall function under the supervision and control of the Ministry of Defence.

(3) The prescribed authorities shall comply with the responsibilities as stipulated in Schedule III of these rules.

**10. Procedure for authorisation.**-Every occupier or operator handling bio-medical waste, irrespective of the quantity shall make an application in Form II to the prescribed authority i.e.

State Pollution Control Board and Pollution Control Committee, as the case may be, for grant of authorisation and the prescribed authority shall grant the provisional authorisation in Form III and the validity of such authorisation for bedded health care facility and operator of a common facility shall be synchronised with the validity of the consents.

(1) The authorisation shall be one time for non-bedded occupiers and the authorisation in such cases shall be deemed to have been granted, if not objected by the prescribed authority within a period of ninety days from the date of receipt of duly completed application along with such necessary documents.

(2) In case of refusal of renewal, cancellation or suspension of the authorisation by the prescribed authority, the reasons shall be recorded in writing:

Provided that the prescribed authority shall give an opportunity of being heard to the applicant before such refusal of the authorisation.

(3) Every application for authorisation shall be disposed of by the prescribed authority within a period of ninety days from the date of receipt of duly completed application along with such necessary documents, failing which it shall be deemed that the authorisation is granted under these rules.

(4) In case of any change in the bio-medical waste generation, handling, treatment and disposal for which authorisation was earlier granted, the occupier or operator shall intimate to the prescribed authority about the change or variation in the activity and shall submit a fresh application in Form II for modification of the conditions of authorisation.

#### **11. Advisory Committee.-**

(1) Every State Government or Union territory Administration shall constitute an Advisory Committee for the respective State or Union territory under the chairmanship of the respective health secretary to oversee the implementation of the rules in the respective state and to advise any improvements and the Advisory Committee shall include representatives from the Departments of Health, Environment, Urban Development, Animal Husbandry and Veterinary Sciences of that State Government or Union territory Administration, State Pollution Control Board or Pollution Control Committee, urban local bodies or local bodies or Municipal Corporation, representatives from Indian Medical Association, common bio-medical waste treatment facility and non-governmental organisation.

(2) Notwithstanding anything contained in sub-rule (1), the Ministry of Defence shall constitute the Advisory Committee (Defence) under the chairmanship of Director General of Health

Services of Armed Forces consisting of representatives from the Ministry of Defence, Ministry of Environment, Forest and Climate Change, Central Pollution Control Board, Ministry of Health and Family Welfare, Armed Forces Medical College or Command Hospital.

(3) The Central Pollution Control Board shall compile, review and analyse the information received and send this information, along with its comments or suggestions or observations to the Ministry of Environment, Forest and Climate Change on or before 31st August every year.

(4) The Annual Reports shall also be available online on the websites of Occupiers, State Pollution Control Boards and Central Pollution Control Board.

**14. Maintenance of records.-** (1) Every authorised person shall maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal or any other form of handling of bio-medical waste, for a period of five years, in accordance with these rules and guidelines issued by the Central Government or the Central Pollution Control Board or the prescribed authority as the case may be.

(2) All records shall be subject to inspection and verification by the prescribed authority or the Ministry of Environment, Forest and Climate Change at any time.

**15. Accident reporting.-** (1) In case of any major accident at any institution or facility or any other site while handling bio-medical waste, the authorised person shall intimate immediately to the prescribed authority about such accident and forward a report within twenty-four hours in writing regarding the remedial steps taken in Form I.

(2) Information regarding all other accidents and remedial steps taken shall be provided in the annual report in accordance with rule 13 by the occupier.

**16. Appeal.-**(1) Any person aggrieved by an order made by the prescribed authority under these rules may, within a period of thirty days from the date on which the order is communicated to him, prefer an appeal in Form V to the Secretary (Environment) of the State Government or Union territory administration .

(2) Any person aggrieved by an order of the Director General Armed Forces Medical Services under these rules may, within thirty days from the date on which the order is communicated to him, prefer an appeal in Form V to the Secretary, Ministry of Environment, Forest and Climate Change.

(3) The authority referred to in sub-para (1) and (2) as the case may be, may entertain the appeal after the expiry of the said period of thirty days, if it is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.

(4) The appeal shall be disposed of within a period of ninety days from the date of its filing.

**17. Site for common bio-medical waste treatment and disposal facility.-**

(1) Without prejudice to rule 5 of these rules, the department in the business allocation of land assignment shall be responsible for providing suitable site for setting up of common biomedical waste treatment and disposal facility in the State Government or Union territory Administration.

(2) The selection of site for setting up of such facility shall be made in consultation with the prescribed authority, other stakeholders and in accordance with guidelines published by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board.

**18. Liability of the occupier, operator of a facility.-**

(1) The occupier or an operator of a common bio-medical waste treatment facility shall be liable for all the damages caused to the environment or the public due to improper handling of bio-medical wastes.

(2) The occupier or operator of common bio-medical waste treatment facility shall be liable for action under section 5 and section 15 of the Act, in case of any violation.

**SCHEDULE I**

[See rules 3 (e), 4(b), 7(1), 7(2), 7(5), 7 (6) and 8(2)]

**Part-1**

**Biomedical wastes categories and their segregation, collection, treatment, processing and disposal options**

<b>Category</b>	<b>Type of Waste</b>	<b>Type of Bag or Container to be used</b>	<b>Treatment and Disposal options</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
Yellow	<b>(a) Human Anatomical Waste:</b> Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).	Yellow coloured non-chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial*

<p><b>(b)Animal Anatomical Waste :</b> Experimental animal carcasses, body parts, organs, tissues, including the waste generated from Animals used in experiments or testing in veterinary hospital source colleges or animal houses.</p>		
<p><b>(c)Soiled Waste:</b> Itemscontaminatedwithblood,bodyfluidslikedressings,plastercasts,cottonswabsand</p>		<p>Incineration or Plasma Pyrolysis or deep burial* In absence of above facilities, autoclaving or micro-waving/</p>
<p>Bags containing residual or discarded blood and blood components.</p>		<p>Hydro claving followed by shred ingormutilationorcombinati on ofsterilizationandshredding.Treated waste to besentforenergy recovery.</p>
<p>(d)ExpiredorDiscardedMedicines:Pharmaceutical wastelike antibiotics,cytotoxic</p>	<p><b>Yellowcoloured non-chlorinatedplasticbags orcontainers</b></p>	<p>Expired` cytotoxicdrugsanditemscontaminatedwithcytotoxicdrugstobereturnedbacktothemanufacturerorsupplierforincinerationattemperature &gt;12000Cortocommonbio-</p>
<p>(e)ChemicalWaste:Chemicals used inproductionofbiologicaland used ordiscardeddisinfectants.</p>	<p><b>Yellowcoloured containersornon-chlorinatedplasticbags</b></p>	<p>DisposedofbyincinerationorPlasmaPyrolysisor Encapsulationinhazardouswastetreatment,storageanddisposalfacility.</p>
<p>(f)ChemicalLiquidWaste : Liquidwastegenerateddue to useofchemicalsinproductionofbiologicalandused</p>	<p><b>Separatecollectionssystemleadingto effluenttreatmentssystem</b></p>	<p>Afterresourcerecovery,thechemicalliquiddwasteshallbepre-treatedbeforemixingwithotherwastewater.ThecombineddischargeshallconformtohedischargenormsgiveninSchedule-III.</p>
<p>(g)Discardediten,mattresses,beddingscontaminated withblood or bodyfluid.</p>	<p><b>Non-chlorinatedyellow plasticbags orsuitablepackingmaterial</b></p>	<p>Non-chlorinatedchemicaldisinfectionfollowedbyincineration orPlasmaPyrolysisorforenergyrecovery.</p>

(h) Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures,	<b>Autoclavesafe plasticbags orcontainers</b>	Pre-treatto sterilizewithnon-chlorinatedchemicalson-siteasperNationalAIDSControlOrganisationorWorldHealthOrganisationguidelinesthereafterforIncineration.
Contaminated Waste(Recyclable) (a)Wastes generated from disposable items such astubing,	<b>Redcolourednon-chlorinatedplasticbags orcontainers</b>	Autoclavingormicro-waving/hydroclavingfollowedbyshreddingormutilationorcombinationofsterilizationandshredding.Treatedwastetobesenttoregisteredorauthorizedrecyclersorforeign
Waste sharps including Metals:Needles,syringes withfixedneedles,needlesfromneedletipcutterorburner,scalpels,blades,or	<b>Punctureproof, Leakproof, tamperproofcontainers</b>	AutoclavingorDryHeatSterilizationfollowedbyshreddingormutilationorencapsulationinmetalcontainerorcementconcrete; combinationofshreddingcumautoclaving;andsentforfinaldisposaltoironfoundries(
(a) Glassware: Broken or discarded and contaminated glass including medicine via Isand ampoules	<b>Card board boxes with blue colored marking</b>	Disinfection(bysoakingthewashedglass wasteaftercleaningwithdetergentandSodiumHypochloritetreatment)orthroughautoclavingormicrowavingorhydroclavingandthensentforrecycling.
(b) Metallic Body Implants	<b>Cardboard boxes with blue colored marking</b>	

Disposal by deep burial is permitted only in rural or remote areas where there is no access to common bio-medical waste treatment facility. This will be carried out with prior approval from the prescribed authority and as per the Standards specified in Schedule-III. The deep burial facility shall be located as per the provisions and guidelines issued by Central Pollution Control Board from time to time.



## CHAPTER 3

### ABOUT THE STUDY AREA (ARAVALLI)

#### INTRODUCTION:

#### History of Arvalli

Before formation, Arvalli district was a part of Sabarkantha district and Sabarkantha district was also a part of "Mahikantha" political agency under British rule. Arvalli district has been in existence by the Gujarat Government's notification No. GHM/2013/69/M/PFR/139/2-1, Date 13/08/13 w.e.f 15/08/2013. There are six Talukas (Sub-districts) in Arvalli district named – Modasa, Bayad, Dhansura, Bhiloda, Malpur and Meghraj. Modasa is the Head Quarter of Arvalli. In Arvalli there are two tribal talukas- Meghraj and Bhiloda and world's oldest Mountain range "Aravalli" passes through it.

**Aravalli district** is a district in the state of Gujarat in India that came into being on August 15, 2013, becoming the 29th district of the state. The district has been carved out of the Sabarkantha district. The district headquarters are at Modasa.

#### Geography and demographics

Aravalli district consists of Modasa, Malpur, Dhansura, Meghraj, Bhiloda and Bayad talukas of former Sabarkantha district. Of these, Meghraj, Malpur and Bhiloda are tribal dominated talukas. The district includes 676 villages and 306 village panchayats with a total population of 1.27 million and is the most literate tribal district in Gujarat



**Modasa** is a town and a municipality in Aravalli district in the Indian state of Gujarat. Modasa became headquarters of new Aravalli district, carved out from tribal-dominated areas of Sabarkantha. The new district was declared on January 26, 2013 and formed on August 15, 2013.

It is an economic centre for agricultural exports, at both the provincial and national levels. As a centre for the surrounding villages, Modasa acts as a transportation hub for both residents and tourists, and has two large hospitals. The city also provides a nucleus of doctors for the people of northern Gujarat and some migrants of southern Rajasthan.

Modasa is a Municipality city in district of Sabarkantha, Gujarat. The Modasa city is divided into 12 wards for which elections are held every 5 years. The Modasa Municipality has population of 67,648 of which 34,917 are males while 32,731 are females as per report released by Census India 2011. Population of Children with age of 0-6 is 8362 which is 12.36 % of total population of Modasa (M). In Modasa Municipality, Female Sex Ratio is of 937 against state average of 919. Moreover Child Sex Ratio in Modasa is around 872 compared to Gujarat state average of 890. Literacy rate of Modasa city is 87.17 % higher than state average of 78.03 %. In Modasa, Male literacy is around 92.92 % while female literacy rate is 81.10%.

Modasa Municipality has total administration over 13,917 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Municipality limits and impose taxes on properties coming under its jurisdiction.

Bayad is a Municipality city in district of Sabarkantha, Gujarat. The Bayad city is divided into 7 wards for which elections are held every 5 years. The Bayad Municipality has population of 17,886 of which 9,357 are males while 8,529 are females as per report released by Census India 2011.

Population of Children with age of 0-6 is 1960 which is 10.96 % of total population of Bayad (M). In Bayad Municipality, Female Sex Ratio is of 912 against state average of 919. Moreover Child Sex Ratio in Bayad is around 810 compared to Gujarat state average of 890. Literacy rate of Bayad city is 82.86 % higher than state average of 78.03 %. In Bayad, Male literacy is around 88.99% while female literacy rate is 76.24%.

Bayad Municipality has total administration over 3,814 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Municipality limits and impose taxes on properties coming under its jurisdiction.

Meghraj is a Census Town city in district of Sabarkantha, Gujarat. The Meghraj Census Town has population of 11,363 of which 5,834 are males while 5,529 are females as per report released by Census India 2011.

Population of Children with age of 0-6 is 1343 which is 11.82 % of total population of Meghraj (CT). In Meghraj Census Town, Female Sex Ratio is of 948 against state average of 919. Moreover Child Sex Ratio in Meghraj is around 784 compared to Gujarat state average of 890. Literacy rate of Meghraj city is 86.05 % higher than state average of 78.03 %. In Meghraj, Male literacy is around 92.68% while female literacy rate is 79.23%.

Meghraj Census Town has total administration over 2,401 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Census Town limits and impose taxes on properties coming under its jurisdiction.

Bhiloda is a Census Town city in district of Sabarkantha, Gujarat. The Bhiloda Census Town has population of 16,074 of which 8,301 are males while 7,773 are females as per report released by Census India 2011.

Population of Children with age of 0-6 is 2011 which is 12.51 % of total population of Bhiloda (CT). In Bhiloda Census Town, Female Sex Ratio is of 936 against state average of 919. Moreover Child Sex Ratio in Bhiloda is around 874 compared to Gujarat state average of 890. Literacy rate of Bhiloda city is 83.50 % higher than state average of 78.03 %. In Bhiloda, Male literacy is around 90.86 % while female literacy rate is 75.73%.

Bhiloda Census Town has total administration over 3,464 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Census Town limits and impose taxes on properties coming under its jurisdiction.

Dhansura is a large village located in Dhansura of Sabarkantha district, Gujarat with total 2665 families residing. The Dhansura village has population of 12424 of which 6459 are males while 5965 are females as per Population Census 2011.

In Dhansura village population of children with age 0-6 is 1304 which makes up 10.50 % of total population of village. Average Sex Ratio of Dhansura village is 924 which is higher than

Gujarat state average of 919. Child Sex Ratio for the Dhansura as per census is 829, lower than Gujarat average of 890.

**Dhansura** village has higher literacy rate compared to Gujarat. In 2011, literacy rate of Dhansura village was 84.03 % compared to 78.03 % of Gujarat. In Dhansura Male literacy stands at 91.07 % while female literacy rate was 76.50%.

**Malpur** is a Census Town city in district of Sabarkantha, Gujarat. The Malpur Census Town has population of 6,378 of which 3,291 are males while 3,087 are females as per report released by Census India 2011. Population of Children with age of 0-6 is 714 which is 11.19 % of total population of Malpur (CT). In Malpur Census Town, Female Sex Ratio is of 938 against state average of 919. Moreover Child Sex Ratio in Malpur is around 821 compared to Gujarat state average of 890. Literacy rate of Malpur city is 83.81 % higher than state average of 78.03 %. In Malpur, Male literacy is around 91.13 % while female literacy rate is 76.13%.

Malpur Census Town has total administration over 1,428 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Census Town limits and impose taxes on properties coming under its jurisdiction.

### 3.1 List of Registered HCU's surveyed

Sr No	Name of HCU	Taluka	Type of HCU	Speciality of HCU	Badded/Non Badded
1	Aaradhana clinic	Meghraj	Clinic/Dispensary	clinic	NB
2	Aarna Surgical Hospital	Modasa	Hospital	Surgical	B
3	Chinmay Eye Hospital	Modasa	Clinic/Dispensary	Optho	B
4	Dr.K.V.Shah	Modasa	Clinic/Dispensary	G P	B
5	Guru Krupa Clinic	Meghraj	Clinic/Dispensary	G.P	B
6	Hari Om clinic	Meghraj	Clinic/Dispensary	Clinic	B
7	Jay Ambe clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
8	Jyoti Eye Hospital	Bayad	Hospital	Optho	B
9	Mehta Clinic	Meghraj	Clinic/Dispensary	B.H.M.S	B
10	Raj Clinic	Meghraj	Clinic/Dispensary	G.P	B
11	Shree Raj clinic	Dhansura	Clinic/Dispensary	B.H.M.S	B
12	Shreeji Dental clinic	Bhiloda	Clinic/Dispensary	Dental	B
13	Shri Hari Denteal	Bayad	Clinic/Dispensary	Dental	B
14	Vatsalya Clinic	Malpur	Clinic/Dispensary	clinic	B
15	Aksheer clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
16	Ansh clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
17	Aya clinic	Bayad	Clinic/Dispensary	G P	B
18	Bhagyoday clinic	Bhiloda	Clinic/Dispensary	Clinic/Dispensary	B

19	Devarsh clinic	Bhiloda	Clinic/Dispensary	G P	B
20	Dr.Jignesh patel	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
21	Dr.Kirit R. Patel	Modasa	Clinic/Dispensary	G P	B
22	Dr.Solanki Ranjitsing k.	Modasa	Clinic/Dispensary	Clinic/Dispensary	B
23	Gayatri clinic	Bhiloda	Clinic/Dispensary	G P	B
24	Jivanyyout clinic	Modasa	Clinic/Dispensary	G P	B
25	Life line clinics	Modasa	Clinic/Dispensary	G P	B
26	Manan Clinic	Meghraj	Clinic/Dispensary	B.H.M.S	B
27	Mantavya Dentel Hospital	Dhansura	Hospital	Dental	B
28	Navdeep clinic	Modasa	Clinic/Dispensary	G P	B
29	Om clinic	Malpur	Clinic/Dispensary	G P	B
30	P H C	Bhiloda	Hospital	Multi-speciality	B
31	Pranali Hospital	Modasa	Hospital	E.N.T	B
32	Santram Clinic	Bhiloda	Clinic/Dispensary	G P	B
33	Sarvoday clinic	Bayad	Clinic/Dispensary	G P	B
34	Shiddhi vinayak	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
35	Shre Ram Seva sumdarclinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
36	Shreji Clinic	Modasa	Clinic/Dispensary	G P	B
37	Uma clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
38	Urban Health Center	Modasa	Hospital	Multi-speciality	B
39	Akshar Hospital	Bhiloda	Hospital	Childran Hospital	B

40	Dr. Haresh S.Bhavsar	Bayad	Clinic/Dispensary	G P	B
41	Dr.Kamleshbhai S.	Modasa	Clinic/Dispensary	G P	B
42	Dr.Rameshbhai S.Gameti	Bhiloda	Clinic/Dispensary	Surgical	B
43	Faith Hospital	Modasa	Hoapital	Nursing Home/Maternity	B
44	Gandhi clinic	Malpur	Clinic/Dispensary	G P	B
45	Gayatri clinic	Meghraj	Clinic/Dispensary	G P	B
46	Gayatri Clinic	Meghraj	Clinic/Dispensary	G.P	B
47	Gr.Chandrakant D.Jain	Modasa	Clinic/Dispensary	G P	B
48	Krupali clinic	Malpur	Clinic/Dispensary	G P	B
49	Nutan Dispesore	Malpur	Clinic/Dispensary	B.H.M.S	B
50	P H C	Bhiloda	Hospital	Multi-speciality	B
51	P.H.C.Gabat	Bayad	Clinic/Dispensary	G P	B
52	P.H.C.Gabat	Bayad	Hospital	G P	B
53	Primary Health center palla	Bhiloda	Clinic/Dispensary	G P	B
54	Ramani blood bank	Modasa	Boold Bank	Pathological	B
55	Shamlaji Clinic	Bhiloda	Clinic/Dispensary	G P	B
56	Shree Sai Hospital	Bhiloda	Hospital	G P	B
57	Shreeji Eye Care	Modasa	Hoapital	Surgical	B
58	Shreeram Hospital	Bhiloda	Clinic/Dispensary	G P	B
59	Uma clinic	Bayad	Clinic/Dispensary	G P	B
60	Varadan Clinic	Malpur	Clinic/Dispensary	G P	B

61	Anand Clinic	Modasa	Clinic/Dispensary	G P	B
62	Ashiti clinic	Bayad	Clinic/Dispensary	G P	B
63	Ayush clinic	Malpur	Clinic/Dispensary	G P	B
64	Dharasti Hospital	Bhiloda	Hospital	Orthopaedic	B
65	Life line clinics	Malpur	Clinic/Dispensary	G P	B
66	Mena Clinic	Bhiloda	Clinic/Dispensary	G P	B
67	mooba Hospital	Bhiloda	Hospital	G P	B
68	P H C	Dhansura	Hospital	Multi-speciality	B
69	P H C	Modasa	Hospital	Multi-speciality	B
70	P H C Patel Dhundha	Meghraj	Hospital	Multi-speciality	B
71	sabar clinic	Bhiloda	Clinic/Dispensary	G P	B
72	Shakti Clinic	Bhiloda	Clinic/Dispensary	G P	B
73	Shiv om clinic	Modasa	Clinic/Dispensary	G P	B
74	Vankar Mangalbhai Kalidas	Modasa	Clinic/Dispensary	Nursing Home/Maternity	B
75	Vision The Eye Care Hospital	Bayad	Hospital	Surgical,Dental	B
76	Vraj clinic	Bayad	Clinic/Dispensary	G P	B
77	Devkrupa clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
78	Ganesh Hospital	Bayad	Hospital	Multi-speciality	B
79	Govt. Ayurvedic Hospital	Meghraj	Hospital	MULTI-speciality	B
80	Jalaram Eye Hospital	Meghraj	Hospital	Ophthalmology	B
81	Jay Shree Clinic	Dhansura	Clinic/Dispensary	G P	B



82	Maa Hospital	Bhiloda	Hospital	Gynaec	B
83	PHC Tintoi	Modasa	Hospital	P H C	B
84	Dr.Vipul S.Sharma	Modasa	Clinic/Dispensary	G P	B
85	Japan clinic	Malpur	Clinic/Dispensary	G P	B
86	P H C	Dhansura	Hospital	Multi-speciality	B
87	P H C KASANA	Meghraj	Hospital	Multi-speciality	B
88	P.H.C. Sathamba	Bayad	Hospital	Multi-speciality	B
89	P.H.C. Vadagam	Dhansura	Hospital	G P	B
90	Patel Yogeshkumar N	Bhiloda	Clinic/Dispensary	G P	B
91	Primary Health center	Bayad	Hospital	P H C	B
92	Primary Health center Akrol	Dhansura	Hospital	G P	B
93	Primary Health Clinic	Modasa	Hospital	Multi-speciality	B
94	Punit Hospital	Modasa	Hospital	Multi-speciality	B
95	Radha Clinic	Bayad	Clinic/Dispensary	G P	B
96	Shree Gayatri Clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
97	Sir Dorabji Tata Trust Hospital	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
98	Amee Clinic	Modasa	Clinic/Dispensary	G P	B
99	Ashish clinic	Modasa	Clinic/Dispensary	G P	B
100	Dr.Bhavin Patel	Modasa	Clinic/Dispensary	G P	B
101	Dr.Bhogilal L	Modasa	Clinic/Dispensary	Nursing Home/Maternity	B
102	Dr.Dinish B.Prajapati	Modasa	Clinic/Dispensary	G P	B

103	Gayatri Orthopaedic Laboratory	Modasa	Laboratory	Orthopaedic	B
104	Gurudev Clinic	Modasa	Clinic/Dispensary	G P	B
105	Jalaram clinic	Dhansura	Clinic/Dispensary	G P	B
106	P H C	Bhiloda	Hospital	Multi-speciality	B
107	Pokar Ronakkumar J	Malpur	Clinic/Dispensary	G P	B
108	Snehal clinic	Modasa	Nursing Home/Maternity	Nursing Home/Maternity	B
109	Sub Center	Meghraj	Hoapital	P H c	B
110	Avni clinic	Dhansura	Clinic/Dispensary	G P	B
111	Dharmi Orthopaedic	Modasa	Hospital	Orthopaedic	B
112	Dr.Mukesh R.Trivedi	Bayad	Clinic/Dispensary	G P	B
113	Joshi Hospital	Bhiloda	Hospital	Multi-speciality	B
114	P H C	Meghraj	Hospital	Multi-speciality	B
115	ramgadhi	Meghraj	Hospital	P H C	B
116	Shreeji clinic	Malpur	Clinic/Dispensary	G P	B
117	Shreeji M Hospital	Modasa	Hospital	Gynaec	B
118	Akshar Hospital	Modasa	Nursing Home/Maternity	Nursing Home/Maternity	B
119	Ashirvad Child Hospital	Modasa	Hospital	Pediatric	B
120	Ashish Orthopaedic	Modasa	Hospital	Orthopaedic	B
121	Bhagyoday Hospital	Modasa	Hospital	Surgical	B
122	Children Anand Hospital	Modasa	Hospital	Pediatric	B
123	Dr.Dilipbhai G. Shah	Modasa	Hoapital	Nursing Home/Maternity	B

124	Dr.Govindbhai M.Patel	Modasa	Clinic/Dispensary	Physician	B
125	Dr.Vlaid M.Shah	Dhansura	Clinic/Dispensary	G P	B
126	Hari Om Clinic	Modasa	Clinic/Dispensary	G P	B
127	Janki Maternity and children Hospital	Bayad	Nursing Home/Maternity	Nursing Home/Maternity	B
128	Kheradi P H C	Bhiloda	Clinic/Dispensary	Multi-speciality	B
129	Krishna clinic	Malpur	Clinic/Dispensary	G P	B
130	Navchetana Hospital	Bhiloda	Hospital	G P	B
131	Navdeep Hosital	Bhiloda	Clinic/Dispensary	Clinic/Dispensary	B
132	Neelkanth Hospital	Malpur	Hospital	Gynaec	B
133	Patel Yogeshkumar N.	Modasa	clinic	Nursing Home/Maternity	B
134	Rajendra J.Gandhi	Modasa	Nursing Home/Maternity	Surgical	B
135	S.I.Davda Orthopadic	Bhiloda	Clinic/Dispensary	Orthopaedic	B
136	Sab Center Meghraj	Meghraj	Hospital	Multi-speciality	B
137	Shakti Children Hospital	Modasa	Hospital	Pediatric	B
138	Shree Maternity Home	Modasa	Nursing Home/Maternity	Gynaec	B
139	Volioly Hospital	Bayad	Hospital	G P	B
140	Ena Malany Hospital	Modasa	Hospital	Gynaec	B
141	Atman ayucare clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	B
142	Baby care childran Hospital	Modasa	Nursing	Pediatric	B
143	Bhakti maternity & Nursing	Modasa	Nursing Home/Maternity	Gynaec	B
144	Lotas Hospital	Modasa	Hospital	G P	B

145	Madhuram Hospital	Malpur	Hospital	G P	B
146	Rajvi Hospital	Bhiloda	Hospital	G P	B
147	Sadguru Clinic	Bhiloda	Clinic/Dispensary	G P	B
148	Sarvoday Hospital	Bhiloda	Hospital	Gynaec	B
149	Soham Hospital	Bhiloda	Hospital	Children Hospital	B
150	Pranami Clinic	Bayad	Clinic/Dispensary	G P	B
151	Alay Clinic	Bayad	Clinic/Dispensary	G P	B
152	Ankur Children Hospital	Modasa	Hospital	Children Hospital	B
153	Chirag Hospital	Modasa	Hospital	Gynaec	B
154	Munthan Hospital	Modasa	Hospital	Orthopaedic	B
155	Om Surgical Hospital	Modasa	Hospital	Surgical	B
156	Sawarpon Hospital	Modasa	Clinic/Dispensary	G P	B
157	Shanji Childran Hospital	Bayad	Hospital	Physician	B
158	Shif Matrrnim Hospital	Modasa	Hospital	Gynaec	B
159	Shreeji X-Ray clinic	Bayad	Clinic/Dispensary	G P	B
160	Sidhi Vinayak Hospital	Modasa	Hospital	Multi-speciality	B
161	Vardan Hospital	Modasa	Hospital	Pediatric	B
162	Vrundavan Hospital	Bhiloda	Hospital	Gynaec	B
163	Shree Navjivan Hospital	Meghraj	Hospital	Gynaec	B
164	Dhawal clinic	Bayad	Clinic/Dispensary	G P	B
165	Vishnu Orthopaedic Hospital	Modasa	Hospital	Orthopaedic	B

166	Jatan Chipdren Hospital	Modasa	Hospital	Pediatric	B
167	Keshav Hospital Bayad	Bayad	Hospital	M.D.Physician	B
168	Meera Newborn care Hospital	Modasa	Hospital	Peadiatric	B
169	Patel Clinic	Dhansura	Clinic/Dispensary	G P	B
170	Aashirvad clinic	Modasa	Clinic/Dispensary	G P	B
171	Avkar Hospital	Modasa	Nursing Home/Maternity	Nursing Home/Maternity	B
172	Avkar Hospital	Modasa	Hospital	Nursing Home/Maternity	B
173	Dharati Hospital	Modasa	Hospital	Physician	B
174	Dr.Jaykumar S.Shah	Bhiloda	Clinic/Dispensary	G P	B
175	Healthy Recovery	Modasa	Clinic/Dispensary	G P	B
176	Mahalaxmi Hospital	Modasa	Hospital	Gynaec	B
177	Navjivan Hospital	Bayad	Hospital&Laboratory	Orthopaedic	B
178	Navjivan Hospital	Bhiloda	Clinic/Dispensary	Orthopaedic	B
179	Sapan Hospital Bayad	Bayad	Hospital	multi-speciality	B
180	Shri Ram eye Hospital	Modasa	Hospital	ophtho	B
181	Shubham clinic	Modasa	Hospital	Dental	B
182	Sparsh Heat Medical Hospital	Modasa	Hoapital	Nursing Home/Maternity	B
183	Vishwn Surgical Hospital	Bayad	Hospital	Surgical	B
184	Harsh Hospital	Bhiloda	Hospital	Gynaec	B
185	Deep Surgical	Modasa	Hospital	Surgical	B
186	General Orthopaedic Hospital	Bhiloda	Hospital	Orthopaedic	B

187	Dr.S.M.Saiyad	Modasa	Clinic/Dispensary	Orthopaedic	B
188	Ashta Hospital	Modasa	Hospital	Nursing Home/Maternity	B
189	Mamta hospital	Bhiloda	Hospital	Gynaec	B
190	meera Hospital	Bhiloda	Hospital	Physician	B
191	Aum Surgical Hospital	Bayad	NursingHome	Surgical	B
192	Ayushman Hospital	Modasa	Hospital	Surgical	B
193	C H C Bayad	Bayad	Hospital	Multi-speciality	B
194	C.H.C	Dhansura	Hospital	Multi-speciality	B
195	Decent Clinic	Modasa	Clinic/Dispensary	G P	B
196	Jayshivam Hospital	Bayad	Hospital	physician	B
197	Meghraj General Hospital	Meghraj	Hospital	Nursing Home/Maternity	B
198	Modasa health car	Modasa	Nursing Home/Maternity	Physician	B
199	Rephral Hospital	Malpur	Hospital	P H C	B
200	rajavi hospital	Modasa	Hospital	Pediatric	B
201	Sanjivani Hospital	Modasa	Hospital	Multi-speciality	B
202	Aastha Clinic	Bhiloda	Clinic/Dispensary	G P	B
203	Gayatri Surgical Hospital	Bayad	Hospital	Nursing,Gynaec,Surgical	B
204	Maitri Hospital	Bhiloda	Hospital	Surgical	B
205	Malhar Hospital	Bayad	Hospital	Pediatric	B
206	Sarvajanik Hospital	Modasa	Hospital	multi-speciality	B
207	All india movement for seva hospital	Bhiloda	Hospital	Multi-speciality	B

208	C H C Meghraj	Meghraj	Hospital	Multi-speciality	B
209	R.h & P.H.C. Medhasan	Modasa	Hospital	Multi-speciality	B
210	Cottege Hospital	Bhiloda	Hospital	G P	B
211	Shrimant fatehsionh Hospital	Bayad	Hospital	gynaec	B
212	Aavkar Dental Hospital	Bhiloda	Hospital	Dental	NB
213	Adharsh Arya clinic	Dhansura	Clinic/Dispensary	clinic	NB
214	Advance Dental care	Modasa	Clinic/Dispensary	Dental	NB
215	Ami clinic	Malpur	Clinic/Dispensary	clinic	NB
216	Anand Clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	NB
217	Anand Hospital	Bayad	Hospital	Dental	NB
218	Arth Dental Clinic	Modasa	Clinic/Dispensary	Dental	NB
219	Asha Hospital	Modasa	Hospital	Dental	NB
220	Ashirvad clinic	Dhansura	Clinic/Dispensary	clinic	NB
221	Ashirvad Laboratory	Modasa	Laboratory	Pathological	NB
222	Ashish Pathology Laboratory	Modasa	Laboratory	Pathological	NB
223	Ashtha Laboratory	Modasa	Laboratory	Pathological	NB
224	Astha Clinic	Bayad	Clinic/Dispensary	B.H.M.S	NB
225	Astha Dental Clinic	Modasa	Clinic/Dispensary	Dental	NB
226	Balaji Dental	Modasa	Hospital	Dental	NB
227	Bansari Dental Clinic	Bayad	Clinic/Dispensary	Dental	NB
228	Bansi Pathological	Bhiloda	Laboratory	Pathological	NB

229	Bharatkumar J Shah	Modasa	Clinic/Dispensary	Clinic/Dispensary	NB
230	Bhavna Clinic	Modasa	Clinic/Dispensary	clinic	NB
231	Chintan Laboratory	Bhiloda	Laboratory	Laboratory	NB
232	Crony Dental Care	Modasa	Hospital	Dental	NB
233	Deep Dental Clinic	Dhansura	Clinic/Dispensary	Dental	NB
234	Delke Dental	Modasa	Hospital	Dental	NB
235	Diler Clinic	Modasa	Clinic	Clinic/Dispensary	NB
236	Divain Dental Hospital	Modasa	Hospital	Dental	NB
237	Dr. Bharat C.Shah	Dhansura	Clinic/Dispensary	clinic	NB
238	Dr. Chandrakant	Modasa	Clinic/Dispensary	Clinic/Dispensary	NB
239	Dr. Gunvant L. Shah	Meghraj	Clinic/Dispensary	clinic	NB
240	Dr. Haresh. I.Shah	Meghraj	Clinic/Dispensary	Clinic/Dispensary	NB
241	Dr. Hiralal N. Patel	Dhansura	Clinic/Dispensary	Clinic	NB
242	Dr.Ashish C.Chauhan	Dhansura	Clinic/Dispensary	clinic	NB
243	Dr.D.K.Maheshwar	Modasa	Clinic/Dispensary	Dental	NB
244	Dr.Kamlesh R.Patel	Bhiloda	Clinic/Dispensary	Clinic/Dispensary	NB
245	Dr.Nagar Meri	Dhansura	Clinic/Dispensary	clinic	NB
246	Dr.Narendra M.Patel	Dhansura	Clinic/Dispensary	clinic	NB
247	Dr.Naresh G.Patel	Modasa	Clinic/Dispensary	clinic	NB
248	Dr.Pramodkumar J Shah	Modasa	Clinic	clinic	NB
249	Dr.R.V.padvi	Meghraj	Clinic/Dispensary	clinic	NB



250	Dr.Shirish N	Dhansura	Clinic/Dispensary	clinic	NB
251	Gaytri clinic	Meghraj	Clinic/Dispensary	Clinic	NB
252	Gurudev Clinic Laboratory	Modasa	Laboratory	Pathological	NB
253	Gurukrupa Dental Hospital	Bayad	Hospital	Dental	NB
254	HARSH DENTAL CLINIC	Modasa	Clinic/Dispensary	Dental	NB
255	Hi-Tech laboratory	Modasa	Laboratory	Pathological	NB
256	Home Clinic	Malpur	Clinic/Dispensary	clinic	NB
257	Hospital	Modasa	Hospital	Multi-speciality	NB
258	Jalaram Dental clinic	Bhiloda	Clinic/Dispensary	Dental	NB
259	Jivandip clinic	Modasa	Clinic/Dispensary	clinic	NB
260	Jivandip Hospital	Modasa	Hospital	Dental	NB
261	Joshi Girish kumar Agrawal	Modasa	Clinic/Dispensary	clinic	NB
262	Krishna clinic	Bhiloda	Laboratory	Laboratory	NB
263	Krishna Laboratory	Modasa	Laboratory	Laboratory	NB
264	Laxmi laboratory	Modasa	Laboratory	Pathological	NB
265	Mansi Surgical Hospital	Modasa	Hospital	surgical	NB
266	maruti pethologi Lob.	Bhiloda	Laboratory	Laboratory	NB
267	Matruchhaya clinic	Meghraj	Clinic/Dispensary	Clinic/Dispensary	NB
268	Navjivan clinic	Malpur	Clinic/Dispensary	B.H.M.S	NB
269	New Tech Laboratory	Modasa	Laboratory	Pathological	NB
270	Om Dental Clinic	Bhiloda	Clinic/Dispensary	Dental	NB

271	Om Dental Clinic	Bayad	Clinic/Dispensary	Dental	NB
272	Om X-Ray & Sonography clinic	Modasa	Clinic/Dispensary	clinic	NB
273	Parikshan Pathology Laboratory	Modasa	Laboratory	Pathological	NB
274	Parv Dental clinic	Malpur	Clinic/Dispensary	Dental	NB
275	Prathana Dental clinic	Modasa	Hospital	Dental	NB
276	Roshan Dental Clinic	Modasa	Hospital	Dental	NB
277	Sabar Dairy Su ceulre	Meghraj	Veternary	Veternary	NB
278	Sagar Dental Clinic	Bhiloda	Clinic/Dispensary	Dental	NB
279	Sai Dental clinic	Meghraj	Clinic/Dispensary	Dental	NB
280	Sai laboratory	Modasa	Laboratory	Pathological	NB
281	Samrth Hospital	Modasa	Hospital	Proctologist	NB
282	Sanjivani Hospital	Modasa	Hospital	M D	NB
283	Sankalp clinic	Modasa	Laboratory	Pathological	NB
284	Saroj pathology Laboratory	Meghraj	Laboratory	Pathological	NB
285	Sarvoday Hospital Bhiloda	Bhiloda	Laboratory	Pathological	NB
286	Satyam Pathological	Modasa	Laboratory	Pathological	NB
287	Sevasadan clinic	Modasa	Clinic/Dispensary	clinic	NB
288	Shadha clinic	Modasa	Clinic/Dispensary	clinic	NB
289	Shafina Clinic	Modasa	Hospital	clinic	NB
290	Shiv clinic	Meghraj	Clinic/Dispensary	clinic	NB
291	Shiv Pathologi Laboratory	Modasa	Laboratory	Pathological	NB

292	Shraddha clinic	Malpur	Clinic/Dispensary	B.H.M.S	NB
293	Shree Imarina center	Modasa	Clinic/Dispensary	Radiolay clinc	NB
294	Shree Pathology Laboratory	Modasa	Laboratory	Pathological	NB
295	Shree Ram Clinic	Modasa	Clinic/Dispensary	clinic	NB
296	Shri Hari Clinic	Bayad	Clinic/Dispensary	Clinic/Dispensary	NB
297	Shri Ram clinic	Meghraj	Clinic/Dispensary	G P	NB
298	Smile care Dental clinic	Modasa	Clinic/Dispensary	Dental	NB
299	Sundaram Pathology Laboratory	Modasa	Laboratory	Pathological	NB
300	The Ghanchi Arogyamandal	Modasa	Hospital	Dental	NB
301	The smilky Pearl dental	Bayad	Clinic/Dispensary	Dental	NB
302	Unic Laboratory	Modasa	Laboratory	Pathological	NB
303	Varga Laboratory	Malpur	Laboratory	Clinic/Dispensary	NB
304	Vedant Dental Hospital	Modasa	Hospital	Dental	NB
305	Vinayak Dental Clinic	Bayad	Hospital	Dental	NB
306	Yashvi Dental care	Modasa	Clinic/Dispensary	Dental	NB

### 3.2 SURVEY METHODOLOGY

Before starting the biomedical waste inventorization, survey planning was made to carryout whole project.

#### Collection of background data information and list of HCU's

Sir P T Science college, Modasa is allotted to carry out survey of specific talukas Aravalli District are as follows

1. Modasa

2. Dhansura,
3. Bayad,
4. Malpur,
5. Megharaj
6. Bhiloda

### **Training to Survey team:**

As the students who are chosen for Survey are from Sir P T Science college, Modasa they were less aware about Biomedical Waste Management. So training become very necessary for the students those who are involved in the project. At first Project head and Project Co ordinators arranged a training session to make aware about the complete process of Biomedical Waste Management. Students were taught about biomedical waste management rules and their application in Collection, Storage, transportation and disposal of Biomedical waste. Communication with HCU representative also plays a very important role in collecting the data. Students are also taught about how to communicate and interact with HCU representative. GEMI also supported us in training students for the Survey by conducting the training program in Sir P T Science college and M N College visnagar.

### **Planning the Survey**

The aim of conducting the survey is to get the needed information as correct and as precise as possible. A survey form is provided by GEMI which covers the maximum information in shortest format and shortest time span. For work planning as soon as we received work order from GEMI, planning for the work has been done. Sir P T Science college, Modasa is conducting survey of Aravalli district taluka Modasa, Dhansura, Bayad, Malpur, Megharaj and Bhiloda, students were given chance to choose the place where they want to do survey. Depending upon the size of taluka, number of students are assigned to each taluka. Time line mentioned by GEMI was also kept in mind while planning whole work. Before executing any work, planning plays a vital role. An activity plan was also prepared to successfully carry out the project.

### **Conducting field survey**

Team of well trained student groups were assigned different talukas for survey. At first students were well taught about the area to be surveyed by them. The map of Modasa city was distributed

among student groups to study their area. Also roads and areas which comes under Aravalli also listed out and given to students. Then students were told to conduct the reconnaissance survey in their area and approximately estimate number of hospitals lies in their area. Afterwards number of students were altered in the group depending upon the number of HCU's in their area. The students who are working in talukas are also provided with maps and list of villages. Students were also trained to interact with the representative of the HCU's. Students shown their immense patience while collecting the data. They visited single HCU more than 2 times, in some cases more than 4 times due to poor response by the HCU representative.

### **Biomedical waste inventorization of Aravalli District Roadmap for the entire project team: Project plan**

- ❖ Priority of activities  
Formation of cell (6 Taluka)

(1) Modasa (2) Dhansura (3) Bayad (4) Malpur (5) Meghraj (6) Bhiloda

- ✓ Invite the student for participation
- ✓ Taluka wise One faculty co coordinator and 10 Students
- ✓ Construction team and allocate team leader
- ✓ A meeting arranged by Project coordinator for providing guidance
  - ✓ Project Background
  - ✓ Objectives
  - ✓ Scope
  - ✓ Constraints

Meeting held at seminar hall Science College on 10-08-2016, 2-00 PM above points discussed.



- ❖ Methodologies and Strategy
  - ✓ Decide survey area of project work
  - ✓ About the Study Area (District)
  - ✓ Details like Demography, Geography, Climate, All HCUs
  - ✓ List of Registered Health Care Units (HCUs), list of non-registered HCUs identified and List of HCUs surveyed
  - ✓ Get list of clinic and hospitals, Aravalli from authority.
  - ✓ Make list of clinic and hospitals Aravalli from GOG



## Chapter 4: Survey Compilation and Analysis

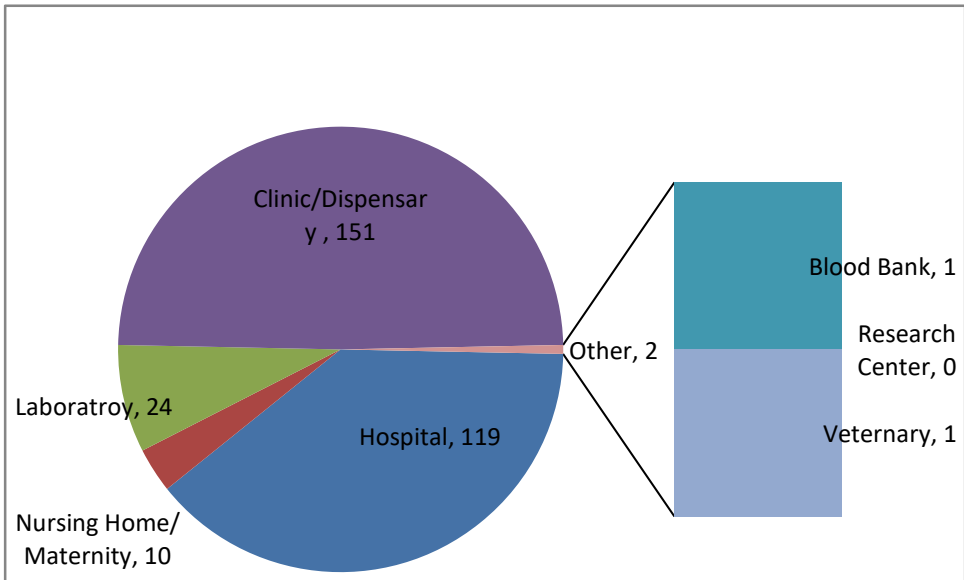
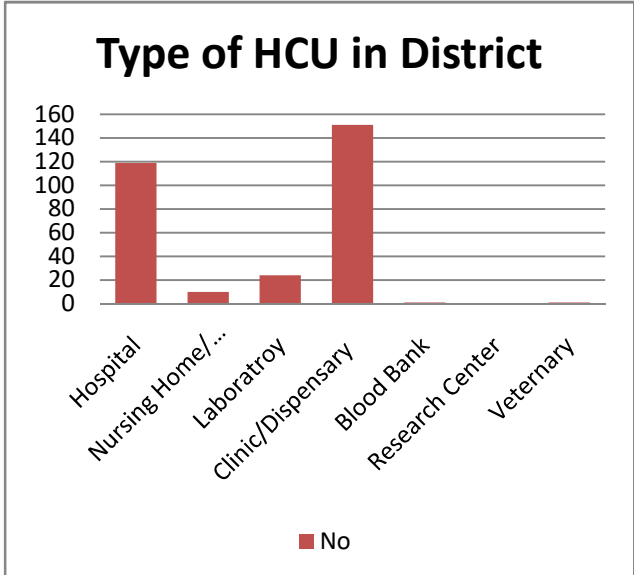
### 4.1 Survey brief

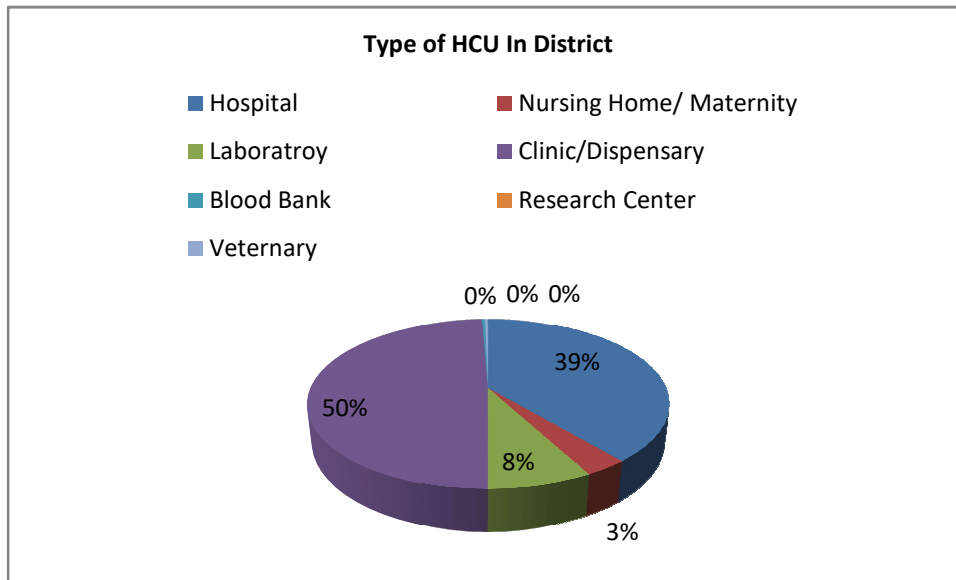
### 4.2 Table, Pi-chart/Bar chart Graph ect.

#### Graph and table section A

#### Total 306 HCU surveyed in Aravalli district

Type of HCU Dist	
TYPE	No
Hospital	119
Nursing Home/ Maternity	10
Laboratroy	24
Clinic/Dispensary	151
Blood Bank	1
Research Center	0
Veternary	1
Total HCU in District	306

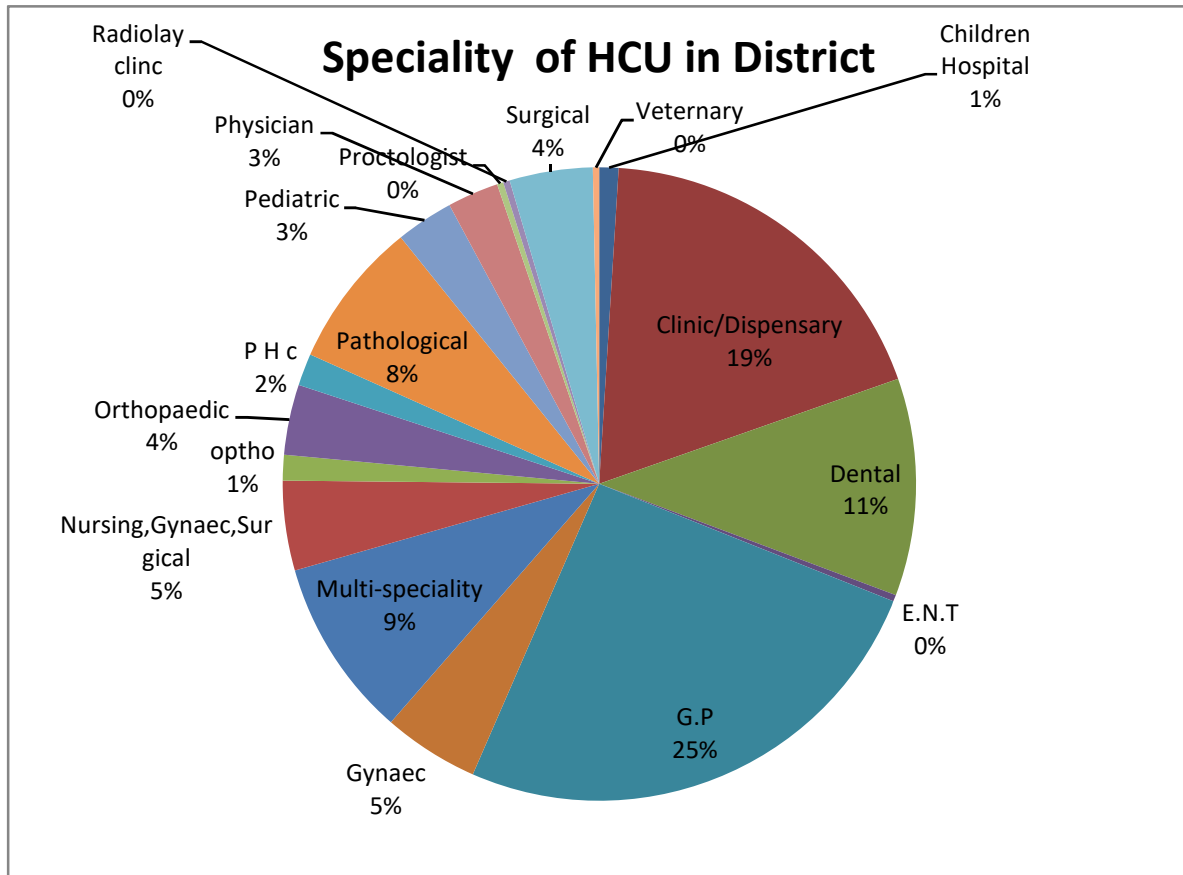
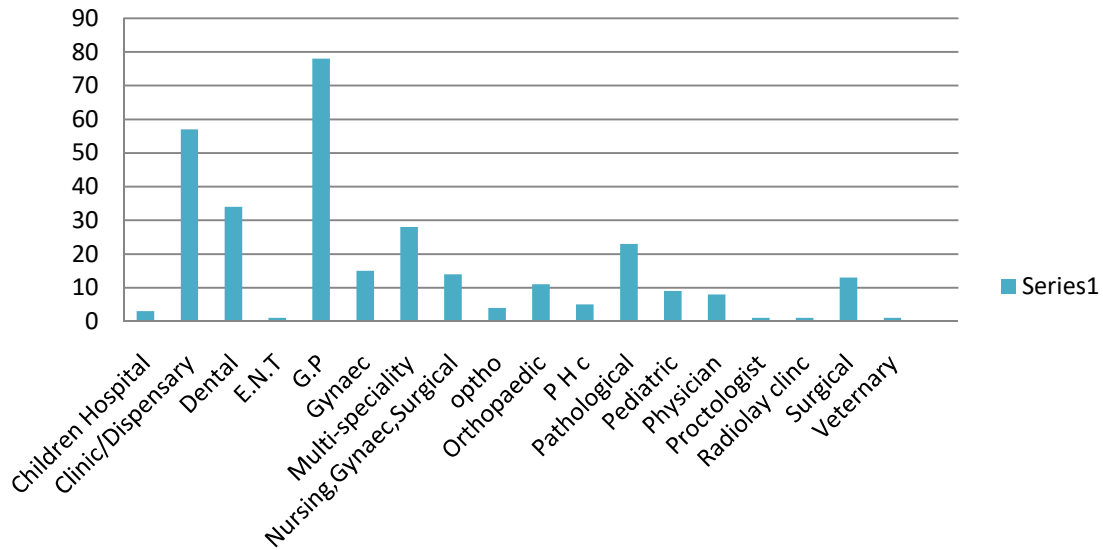


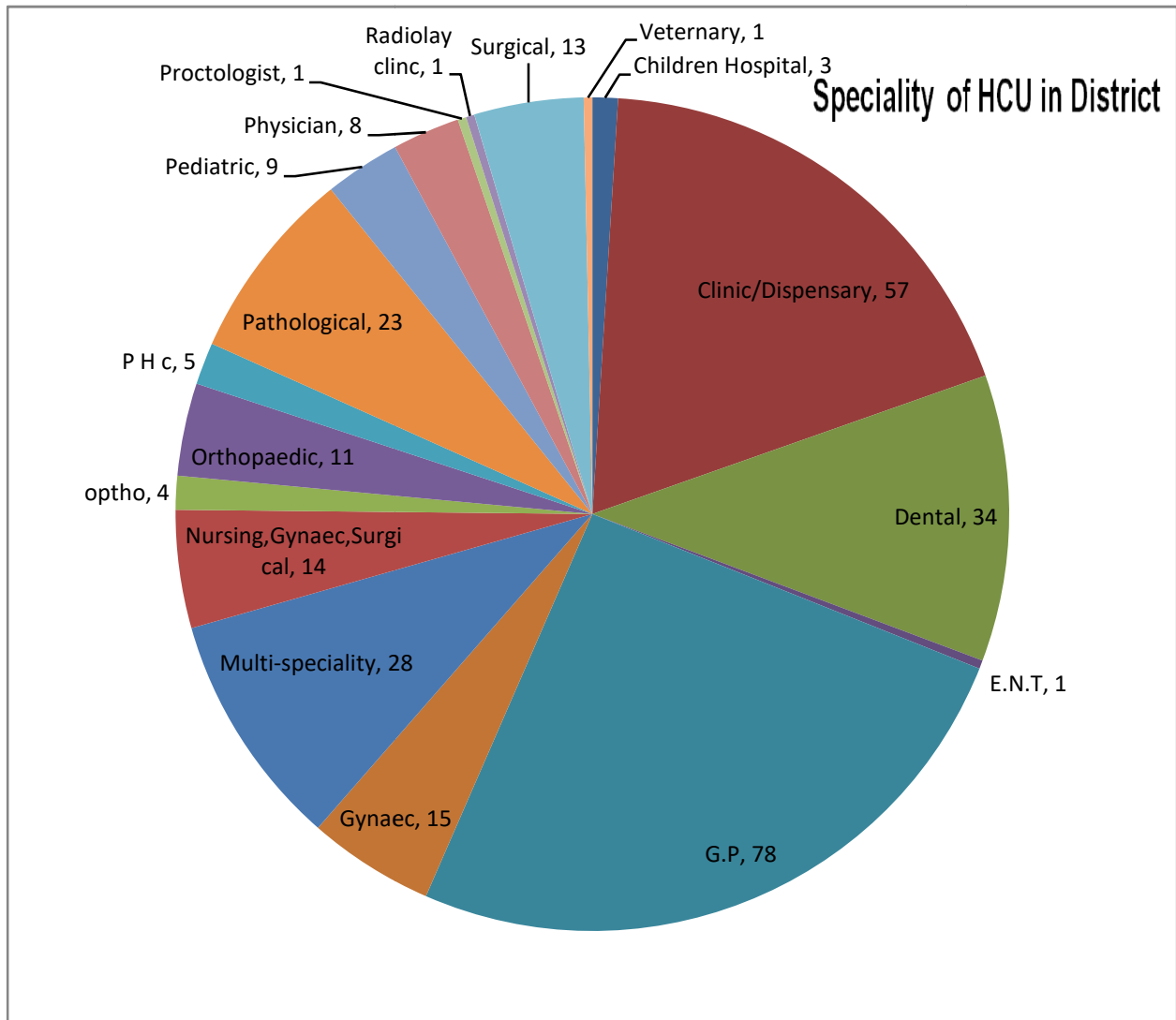


Speciality	No of HCU (306)
Children Hospital	3
Clinic/Dispensary	57
Dental	34
E.N.T	1
G.P	78
Gyneac	15
Multi-speciality	28
Nursing, Gynaec, Surgical	14
optho	4
Orthopaedic	11
P H c	5
Pathological	23
Pediatric	9
Physician	8
Proctologist	1
Radiolay clinc	1
Surgical	13
Veterinary	1



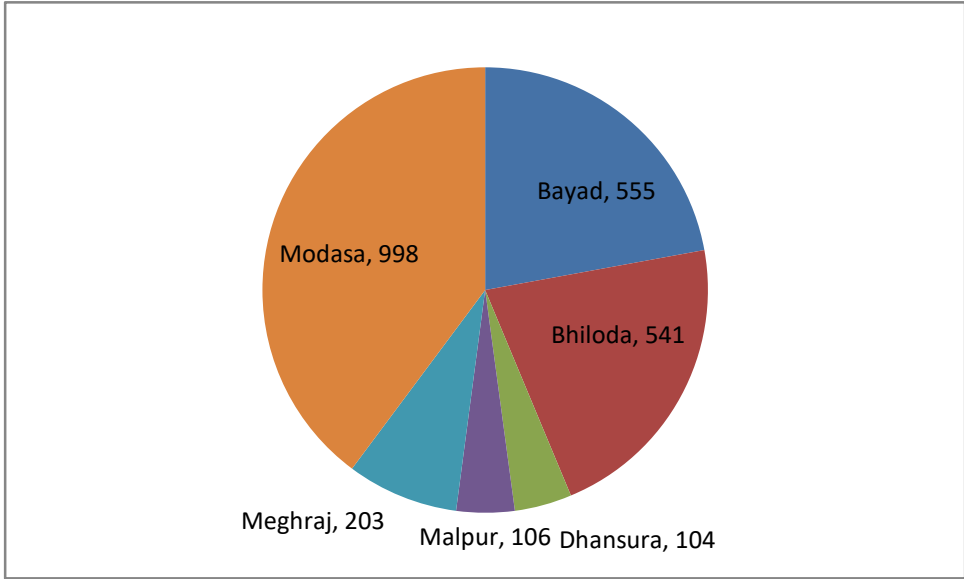
## Speciality of HCU in District





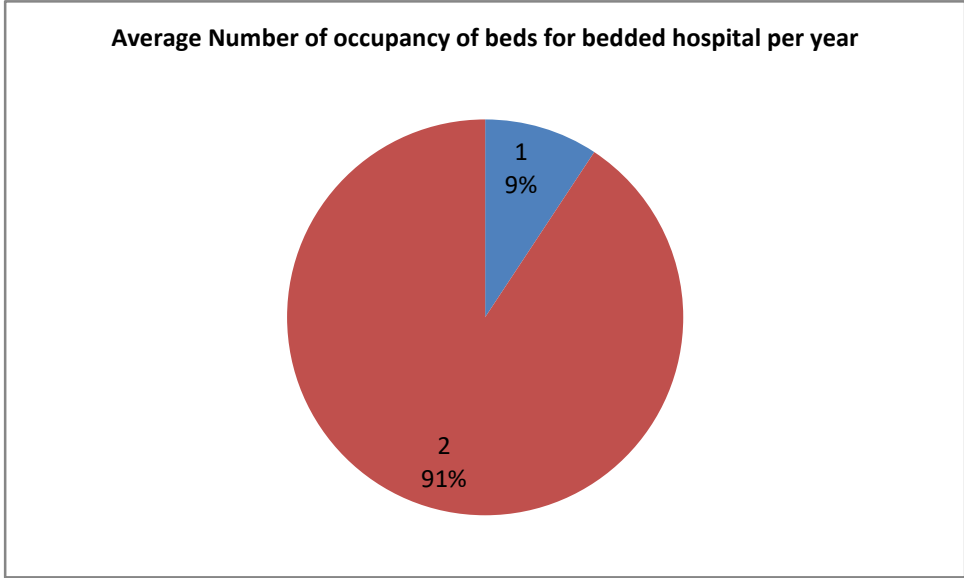
### Taluka Wise

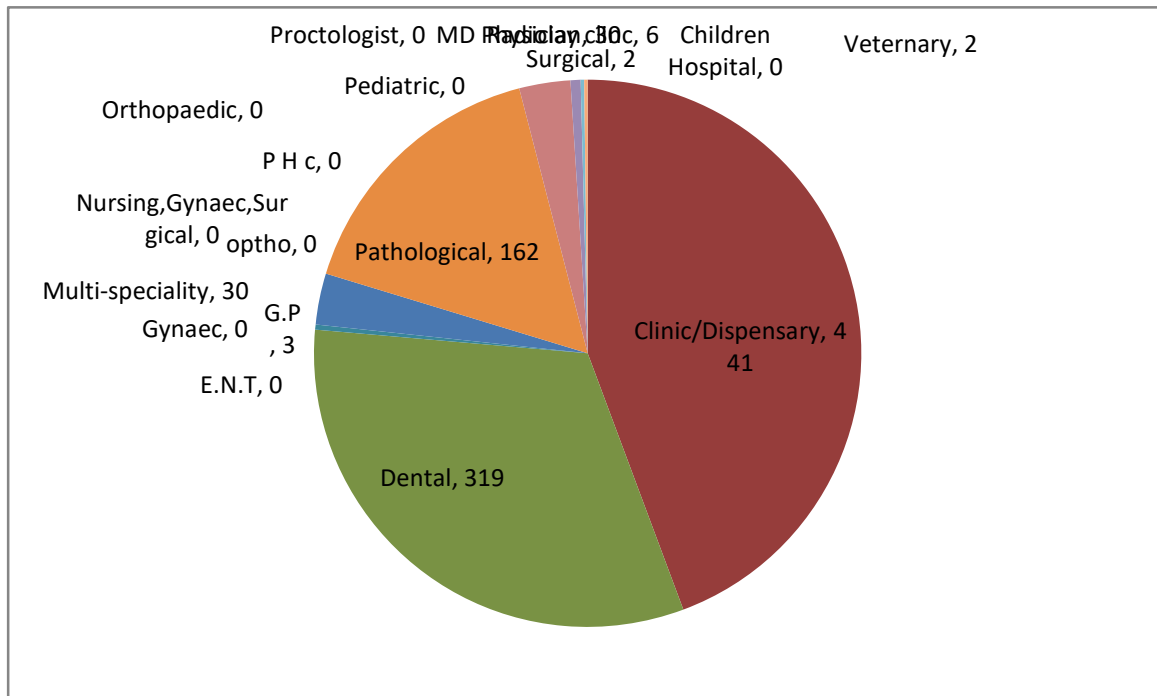
Taluka	No of Beds
Bayad	555
Bhiloda	541
Dhansura	104
Malpur	106
Meghraj	203
Modasa	998
Total	2507



**Average Number of occupancy of beds for bedded hospital per year**

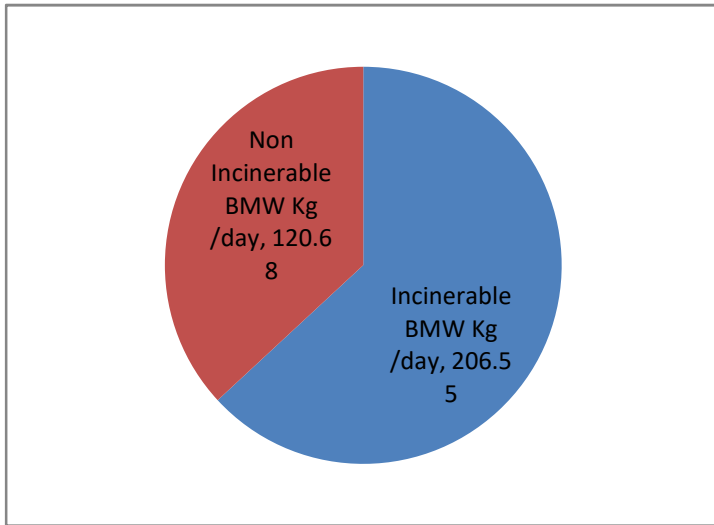
2507      24500      9.77



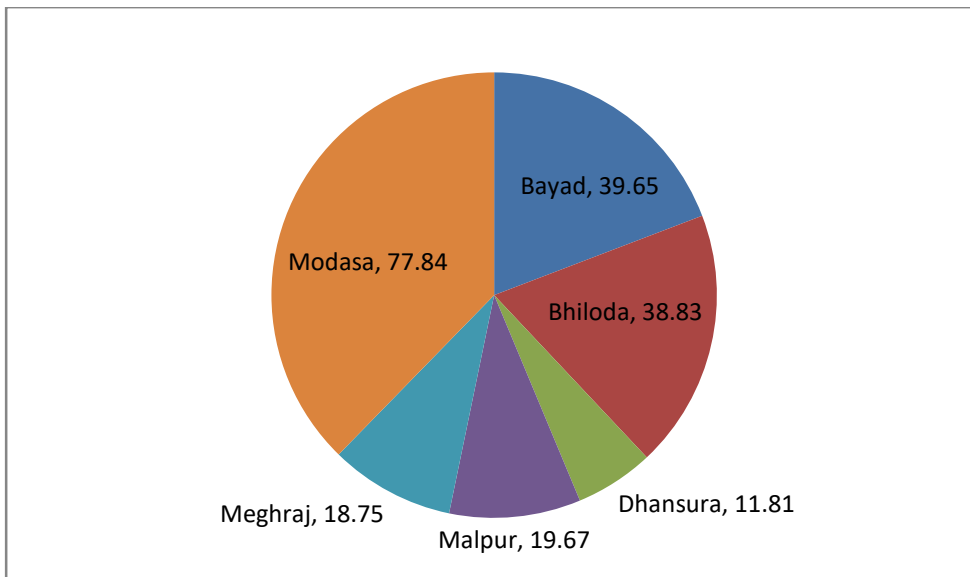


**Table, Pi-chart/Bar chart Graph ect. of section B**

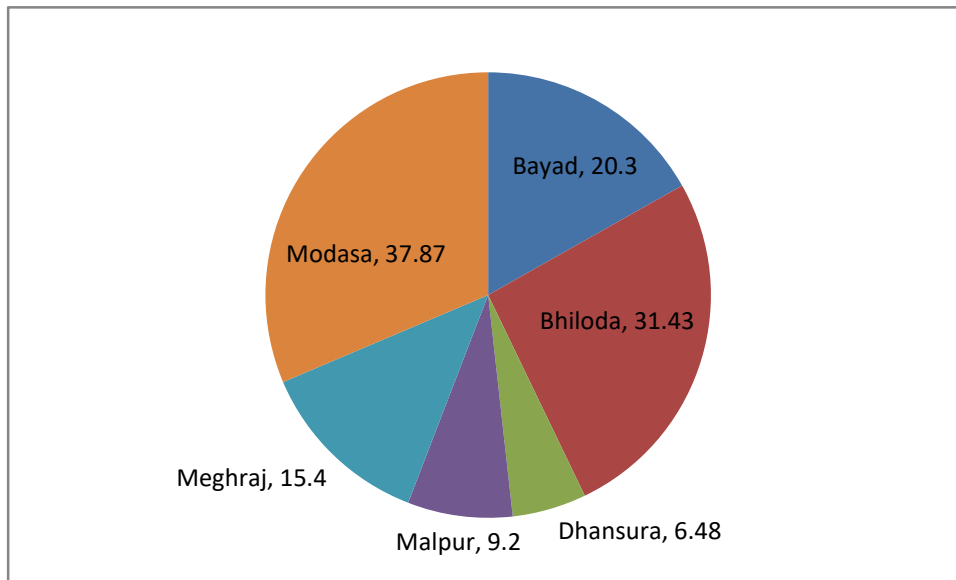
<b>Incinerable BMW Kg /day</b>	<b>Non Incinerable BMW Kg /day</b>	<b>Total BMW Kg /day</b>
206.55	120.68	327.23



Taluka	Incinerable BMW kg/Day	Noincinerable BMW kg/Day	Total
Bayad	39.65	20.3	59.9
Bhiloda	38.83	31.43	70.26
Dhansura	11.81	6.48	18.29
Malpur	19.67	9.2	28.87
Meghraj	18.75	15.4	34.15
Modasa	77.84	37.87	116.21
<b>Total</b>	<b>206.55</b>	<b>120.68</b>	<b>327.23</b>



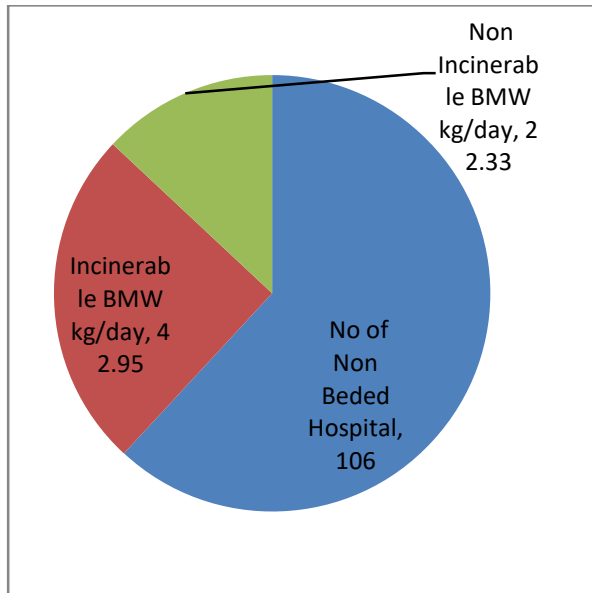
**Incinerable BMW kg/Day**



**Noincinerable BMW kg/Day**

No of Beded	Total Bed	Average Bed
210	2507	11.93
163.6	98.35	261.95

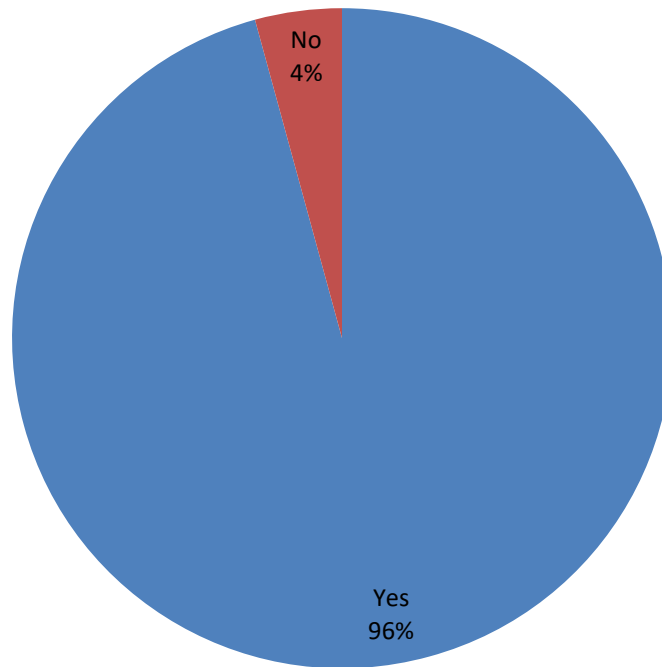
No of Non Beded Hospital	Incinerable BMW kg/day	Non Incinerable BMW kg/day	Total BMW kg/day
106	42.95	22.33	65.28



**Graph and table section C**

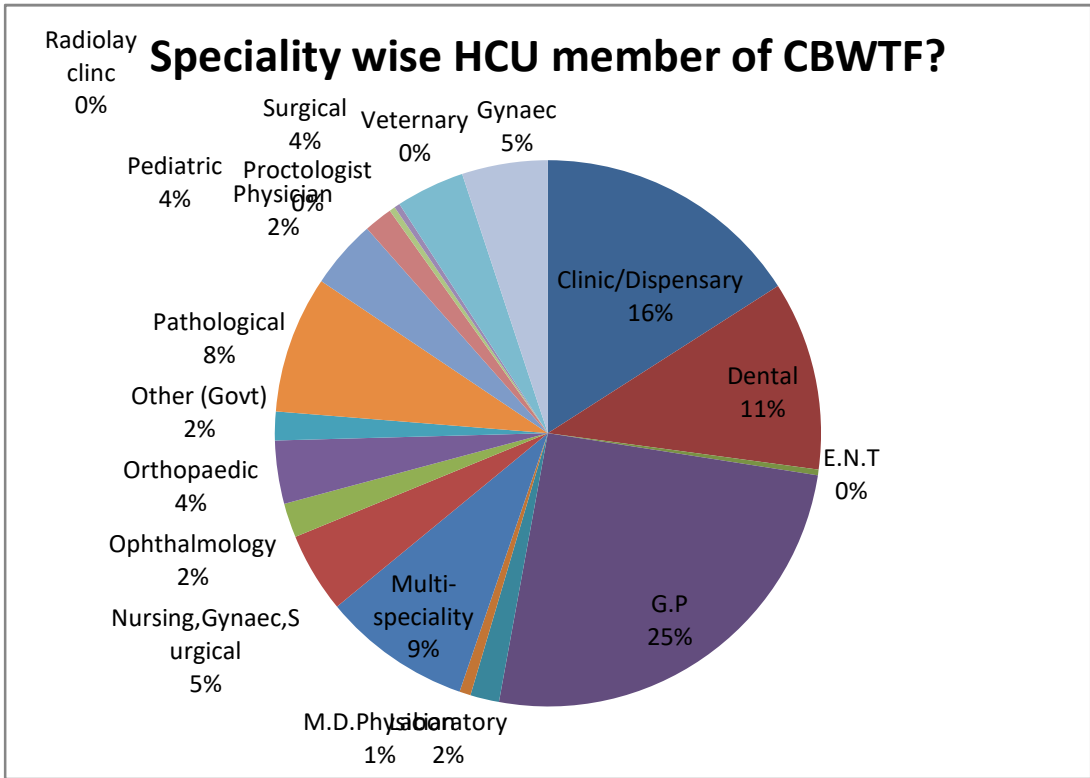
**The membership of CBWTF is 293 rest of 13 HCU is not avail CBWTF**

### HCU a member of CBWTF?

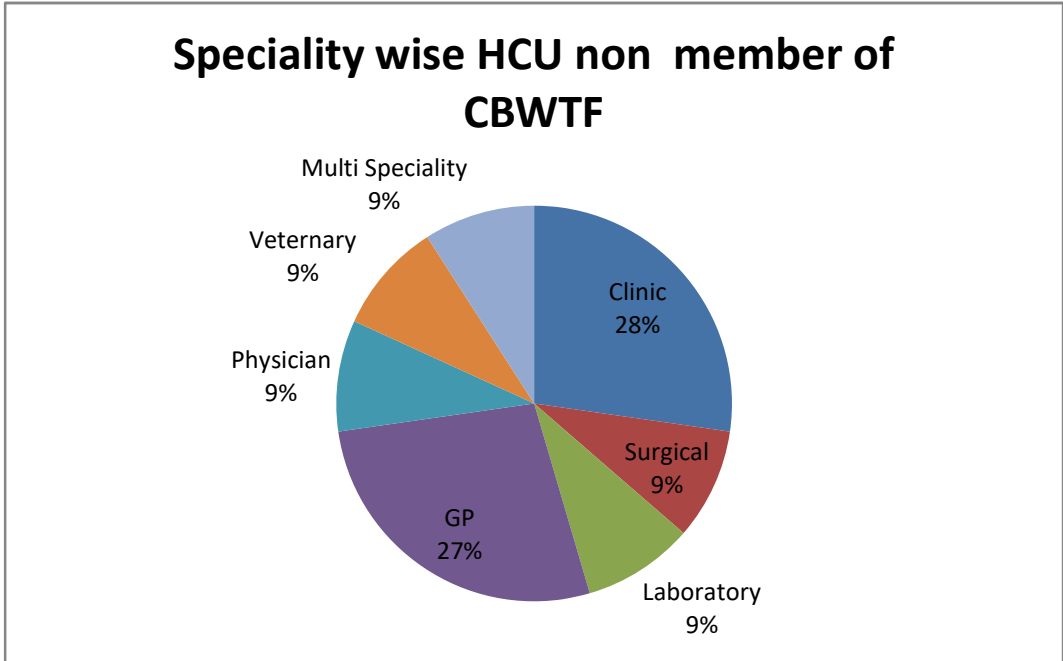


The speciality wise total 295 HCUs member of CBWTF as follow





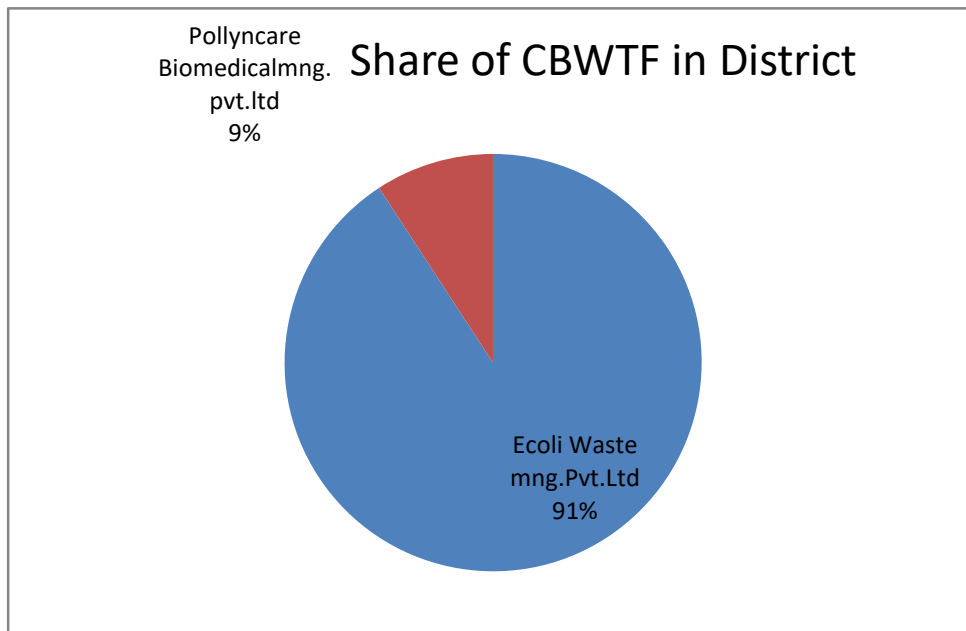
The speciality wise total 11 HCUs non member of CBWTF as follow



**Share of CBWTF in District**

Share of CBWTF in District	
Ecoli Waste mng.Pvt.Ltd	266
Pollucare Biomedicalmng.pvt.ltd	27
Total	293

### The percentage wise share of CBWTF in District



The Average Frequency of collection by CBWTF of all HCUs is observed as

-Daily

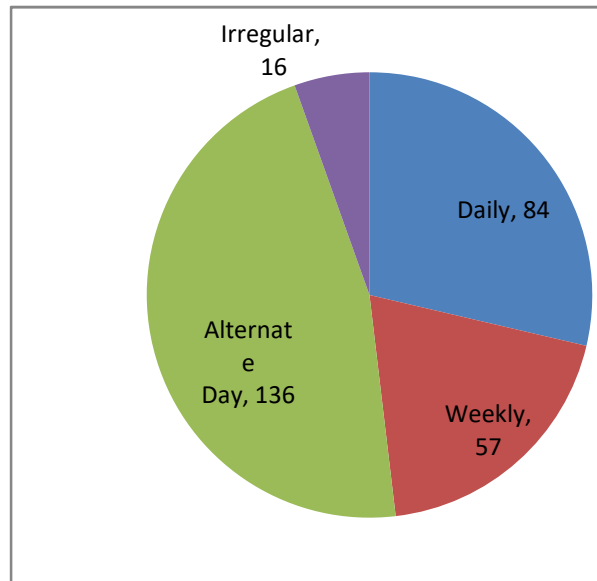
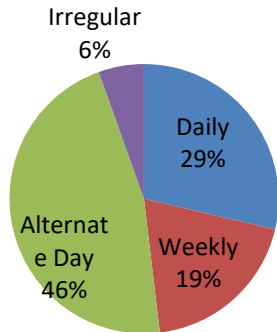
-Weekly

-Alternate day

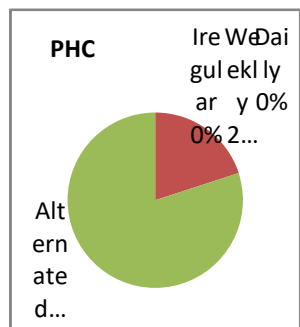
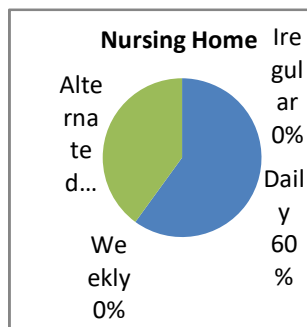
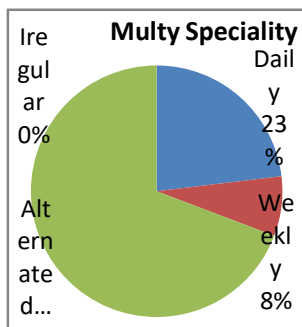
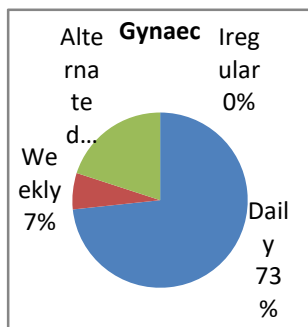
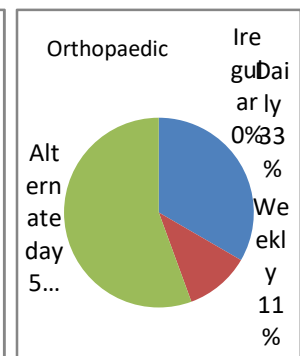
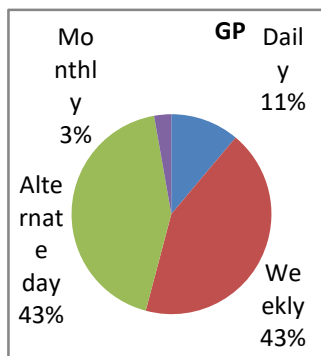
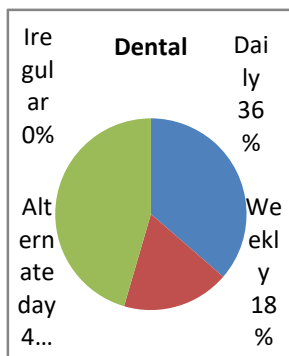
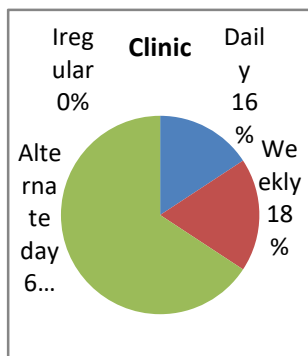
-Irregular

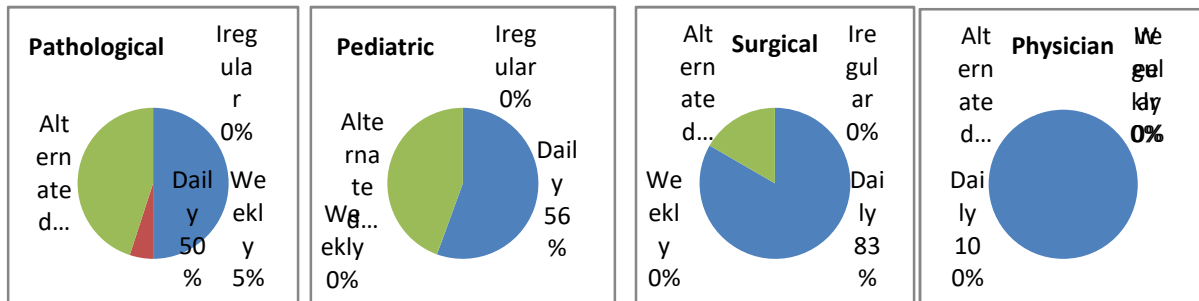
The Average Frequency of collection by CBWTF of all HCUs is observed as

### Average frequency of Collection by CBWTF from all HCU

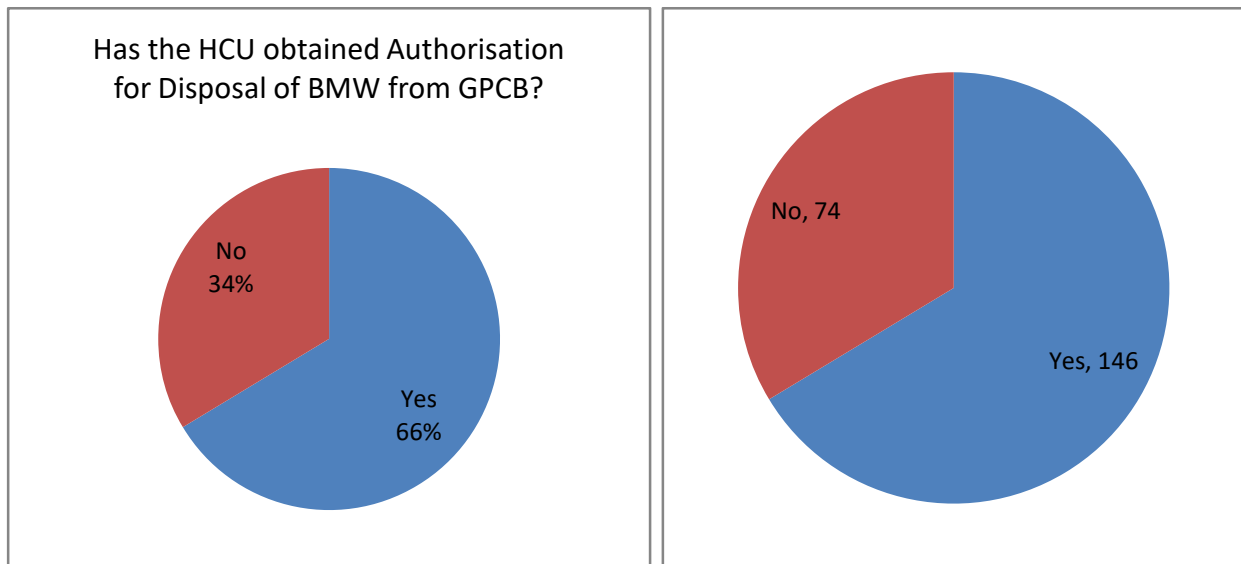


The Average Frequency of collection by CBWTF of all HCUs Speciality wise is observed as

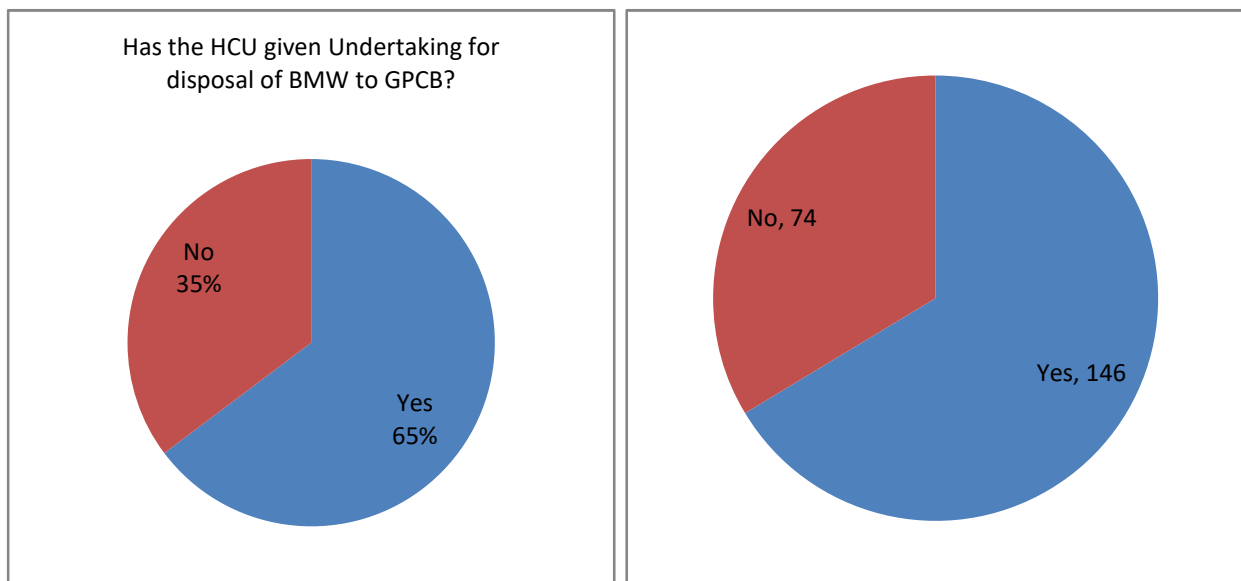




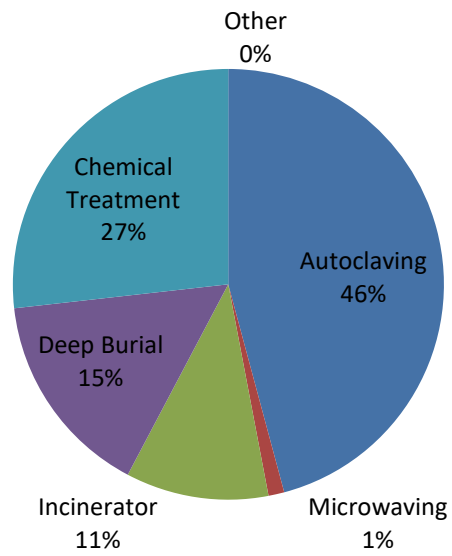
The HCU authorization obtained by from GPCB for Disposal of BMW in Distric



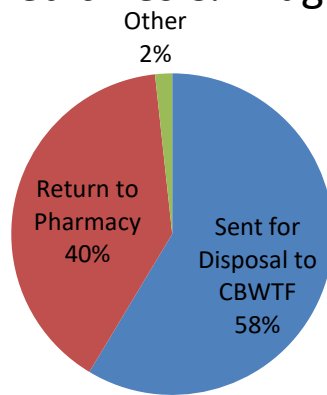
HCU giving undertaking for disposal of Bio-Medical Waste to GPCB



**The facilities available within HCU for treatment of BMW**

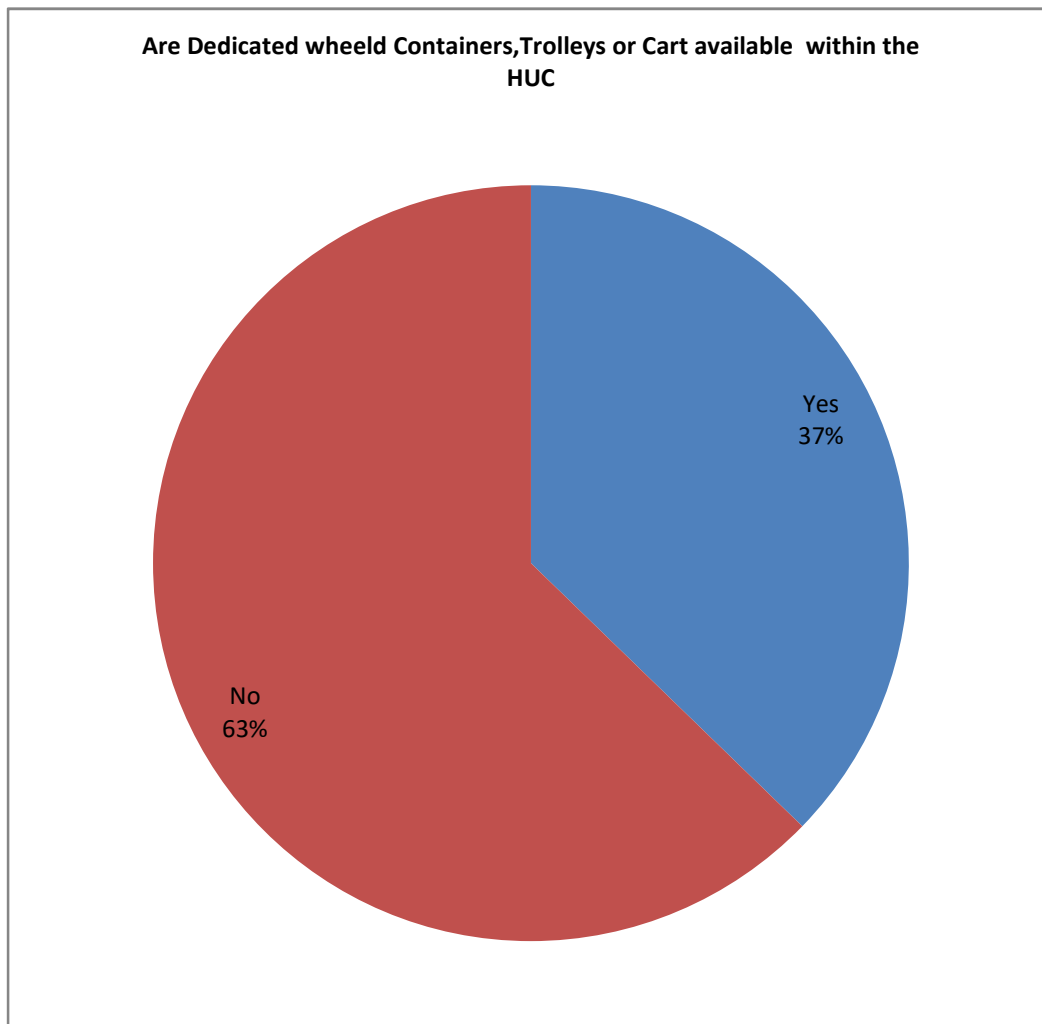


**What do you do with expired medicines & Drugs?**

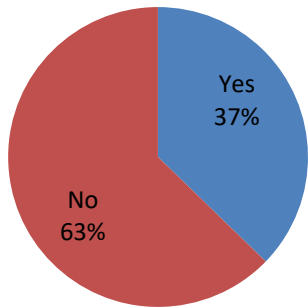


### Section D Chart and Graph

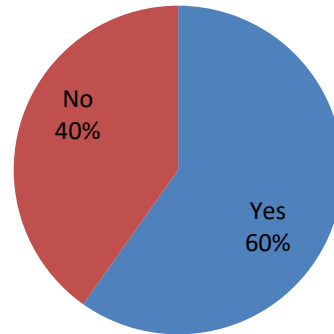
Personal Protective Equipment (PPE) in 243 HCU	
Hand Gloves	<b>233</b>
Head Cover	<b>82</b>
Face mask	<b>198</b>
Shoe Cover	<b>42</b>
Goggles	<b>42</b>
Gown/Apron	<b>101</b>
Cytotoxic PPEs	<b>0</b>
Others	<b>0</b>



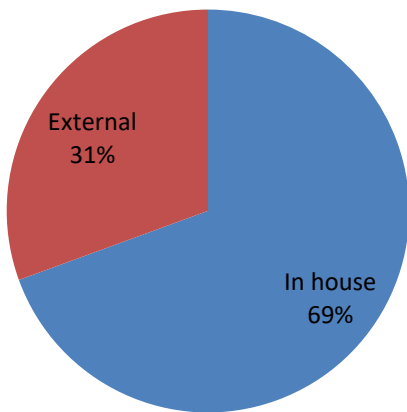
**Are Dedicated wheeld Containers,Trolleys or Cart available within the HUC**



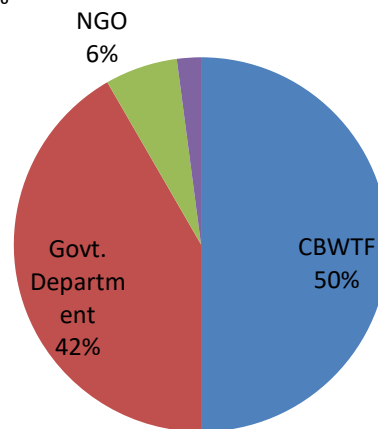
**Is HCU Providing training to BMW Handlers?**



**Mode of Training**



**If External, Specify the training provider to BMW handlers**



## **Discussion and Conclusion**

As per the observations and report of six Taluka of Aravalli District it is concluded that all the HCU generating bio-medical waste. It includes hazardous waste in the form of solid and liquid. Not a significant numbers of HCU from Aravalli has its own treatment and disposal mechanism. All most the HCU hand over their bio-medical waste to the CBWTF agency. The staffs of the Government HCU are trained to handle the waste but, in private hospitals the staffs are not adequately aware about the training. The transport and disposal facilities of solid waste are not up to the mark even in government hospitals. For liquid waste there is no proper record about the quantity of waste generated and their discharging measures. There is neither attempt to minimize the quantity of waste generation nor any mechanism to decrease the toxicity of the waste. There is no any provision by the management to have any innovations, equipments in the future to treat the waste generation at the source level.

Thus it is cleared that in Aravalli there is more requirement for efficient management of hospital waste is in existence. The rules and regulations regarding to the bio-medical waste is no adequately followed. The government as well as private hospitals are requiring in proper management and disposal of their waste in accordance to the environmental rules.