

**Medical Waste Disposal at BRAC Health Centres :
An Environmental Study**

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Abstract

The study was conducted to determine the awareness level of BRAC's Health Centre staff on disposal and handling of medical wastes, and to recommend improved methods to handle and dispose of medical waste in order to minimize the adverse impact on human health and the environment. Data was collected from 14 BHCs between during December to March 1997 from Mymensingh and Dinajpur districts using a two pronged approach: (i) field observations, and (ii) interviews. It was found that the health centers that dealt with deliveries and laboratory facilities produce hazardous and pathological waste. There is insufficient awareness of the magnitude of the medical waste issue by health care workers and their beneficiaries. Proper laboratory techniques (both preparation and analysis), and disposal of waste water are overlooked. In BHCs waste was burnt in open pits behind the clinic facilities and buried in the ground, and there was rarely a fixed location. The chemicals used for the staining and preservation of slides and for the sterilization and cleaning of equipment and surroundings are potentially harmful to the laboratory technician and the environment. There has been no formal training of staff to teach them how to deal with the disposal of medical wastes, although they received training on laboratory analysis, but it is done on an adhoc basis. Environmental and health impacts associated with laboratory, delivery and tuberculosis wastes are: accumulation of toxic chemicals within the soil (proximity to agricultural fields, humans, soil organisms, wildlife, cattle); ground water contamination; public nuisance; improper sterilization of instruments used in labour room causing infection to mother and child; habitat destruction due to the increasing the number of sites necessary for disposal of degradable and non-degradable wastes. Open air burning does not guarantee proper incineration, and releases toxic fumes into the atmosphere from the burning of plastics i.e., PCB's. In conclusion, it can be said that close monitoring of existing safety regulations and guidelines, increasing awareness on environmental hazards, and proper waste management planning is needed to ensure health and environmental safety.

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Executive Summary

One type of waste is completely ignored in Bangladesh that is medical waste. It contaminates both human and social environments. It causes disease and illness in man, either through direct contact or indirectly by contamination of soil, ground water, surface water, and air. Medical wastes, therefore, poses a risk to individuals, communities, animals and the environment, and require careful and effective handling. Government policies are inadequate and do not provide any guide for health providers, and there are few ways to punish offenders.

This study, conducted during December 1996 to March 1997, investigated the waste disposal practice of BRAC's Health Centre's. The specific objectives of this study were to determine the awareness level of BRAC's Health Centre staff on disposal and handling of medical wastes and to recommend improved methods to handle and dispose of medical waste, with the aim of minimizing the adverse impact on human health and the environment.

Data were collected using a two pronged approach: (i) field observations, and (ii) interviews. Nine BHCs were visited in Mymensingh and five were visited in Dinajpur. The facilities available at each centre varied, with some providing delivery services and others having laboratories on site for collecting and analysing sputum, blood, urine, stool, and urine tests by lab technicians. The overall findings indicate that proper attention is needed to increase the awareness level and knowledge on appropriate handling and disposal methods of medical wastes. Proper laboratory techniques (both preparation and analysis), and disposal of waste water are overlooked.

Recommendations made for BHCs are:

Awareness and education, Close monitoring of existing guidelines, Planned disposal sites, Separate concrete pit chamber, use of biohazard bags, A self contained incinerator, Elimination of Xylene and Phenol at BRAC's Health Centre's, Expansion of investigation from a pilot project into a national level investigation, Introduction of environment and waste management issues in VO meeting, and Treatment facility for laboratory wastewater. These recommendations may minimize the negative impacts on human health and the environment.

INTRODUCTION

In December 1995, BRAC established an Environment Group (EG) to integrate an environmental component into its activities and programmes. The EG has begun to incorporate environmental sustainable practices through development of an environmental training manual, introduction of environmental training, seminar and environmental investigations of BRAC's sericulture, fisheries, and dairy programmes. By providing this type of assistance, BRAC's present and future programmes will become sustainable and in compliance with Bangladesh's environmental legislation.

Presently, in Bangladesh, all types of wastes generated in most urban and rural areas are disposed of by open dumping, either in low depressions or high areas for natural degradation. The soil underlying these dumps is contaminated by pathogenic micro organisms, heavy metals, salts, and chlorinated hydrocarbons. This type of disposal also has social costs, such as the clogging of sewers and open drains, encroaching into roads, degrading the landscape and emitting unpleasant odours and dust. No regard is given to location of these dumps, and many are located in the vicinity of living quarters, where activities such as bathing, washing of utensils and eating occur.

There is no structured form of waste treatment for now practiced in Bangladesh. Most of it is dumped in open areas for natural degradation or re-sold by scavengers. A significant number of the urban poor in Bangladesh rely on the collection and re-cycling of secondary materials as their primary source of income. The waste pickers (scavengers) sort through the waste at site (usually open dumps) and sell anything that can be recycled to agents of industry. The waste pickers have no special protective clothing for sorting waste and are in danger of serious injury or illness.

Disposal of medical waste is completely ignored in Bangladesh. Improper disposal of medical wastes contaminates human and social environments. It causes diseases and illness in humans, either through direct contact or indirectly, by contamination of soil, ground water, surface water, and air. Airborne dust from these dumps have the potential to carry pathogens and hazardous materials. With domestic animals being allowed to forage in open dumps, there is the added risk

of reintroducing pathogenic micro organisms into the food chain. Medical waste therefore poses a risk to individuals, communities, animals and the environment, and requires careful and effective handling.

There is no provision made for the separate collection of medical waste in Bangladesh. This results in inappropriate disposal of medical waste by hospitals, medical schools, clinics and pharmaceutical companies. A recently conducted survey by Rashid (1996) looked at the problems of medical waste disposal in Dhaka City. It found that government hospitals dumped all wastes in open dustbins, leaving it exposed for up to two days. Other hospitals left their wastes in open dustbins for up to three days at a time, before the municipality would remove it. At the Orthopedic Hospital, parts of human remains were discarded in dustbins. It was also found that revenue was generated by some medical staff through the sale of medical waste. Syringes and other medical wastes were re-sold and clinical wastes sold at Tk 20/kg at most hospitals visited. The researcher concluded that there was a lack of knowledge and interest in safe disposal of waste by most health workers, and absence of budget to effectively implement safe waste disposal.

The Bangladesh health structure lacks the necessary management facilities to deal with medical waste effectively. Inadequate government policies do not provide a guide for health providers, and there are few ways to punish offenders. One major problem with implementing a waste management programme is that any planned changes to the system of collection or disposal will affect the livelihoods of those sections of the population who depend on it. As such, any changes which do occur are likely to be opposed by the informal sector.

The Bangladeshi Government's Environmental Policy 1992 (in BELA, 1996), has six general aims which have been further detailed into priority objectives for different sectors. Applicable to medical waste disposal practices are the objectives under the Health and Sanitation Category. The following are the relevant government objectives for this study:

- *Prevent activities which are harmful to public health in all spheres, including development activities in the country*
- *Ensure a healthy workplace for workers*

The improper handling and disposal of medical waste will undoubtedly fail to ensure a healthy workplace for workers. These activities are also harmful to the public health and environment.

The government's broad objectives for improving environmental health under the Environmental Policy Health and Sanitation Category are all encompassing, however not detailed. The purpose of this study is to use the government's objectives as a baseline, however, for a more focused examination with regard to BRAC's activities, we have developed our own set of objectives which will apply for this study.

LEGISLATION

The Bangladesh Environment Protection Act 1995, defines pollution as "contamination or alteration of the physical, chemical or biological properties of air, water, or soil, including the change in temperature, taste, turbidity, odour or any other characteristics of these or such discharge of any liquid, gaseous, solid and radioactive substance, the discharge, disposal and dumping of which may cause adverse/negative changes of the environment."

There is no specific legislation pertaining directly to the handling, transportation or disposal of medical waste in Bangladesh's Environmental Protection Act 1995. However, medical waste can be classified under Section 2 (1) which defines waste as "any liquid, solid and radioactive substance that is discharged, disposed, or dumped which may cause adverse/negative change to the environment."

Liability

Since the regulatory measures required for supporting the implementation of the Environmental Protection Act 1995 have yet to be prepared, there are as yet no legal provisions for dealing with offenders. However, when powers are bestowed to the Ministry of Environment and Forests, the Director will have the ability to make the polluter pay either in the form of a fine up to Taka 100 000 or a term of imprisonment or both. Within the next five years the enforcement of environmental legislation should begin to occur. It will serve in BRAC's interest to comply with

these regulations and to work towards presenting a healthy environment for the nation in future years. BRAC's adherence to environmental legislation now and not later will serve as a precedent to others in Bangladesh, and show itself to be a leader in environmental awareness and sustainability.

HEALTH PROGRAMMES

The management of BRAC's health system is a multi-tiered structure. The diagram (appendix 1) illustrates the different tiers, with lower level staff reporting to the medical officer and area managers who in turn report to a regional manager. The overall programme nationwide is coordinated by a Programme Manager, based in Dhaka and reporting to the director of Health and Population Division (HPD). The director of HPD then informs the Executive Director of programmes and policies being implemented or revised.

The area manager/medical officer is responsible for running BRAC Health Centres (BHC) which form the core of the BRAC Health Programmes. The first BHC was established in May 1995, in the Thana of Ranigonj, in the District of Dinajpur, to provide primary health care facilities to villagers. Over two decades, BRAC has moved away from its early efforts to deliver health services to its current emphasis on enabling people to address their own health concerns, by focusing on preventive measures, with primary health care at the forefront. BRAC presently has 24 health centres located in Mymensingh, Dinajpur and Bogra area. Twenty one clinics are in HPD Reproductive Health and Disease Control (RHDC) areas and three in RDP areas. The management is done by HPD. BHCs work on a patient referral system, where they direct potential patients to seek care at the BHC for treatment of minor illnesses and birth deliveries. Complicated cases and serious illnesses are referred to the Thana Health Complex (THC) or a government hospital (appendix 2).

BRAC members pay a service charge of Tk 10 and non-members pay a higher premium of Tk 20 for the use of BHCs facilities. These service charges contribute to meeting the costs of running the health centres. Additional charges are levied depending on services required by patients.

OBJECTIVES

Specifically the objectives of this study are to:

- Determine the awareness level of BRAC's Health Centre Staff on medical waste disposal.
- Discover how medical waste is handled at BRAC's Health Centre's.
- Recommend improved methods to handle and dispose of medical waste, with the aim of minimizing the impact on human health and the environment.

This investigation will examine the practices of medical waste disposal in BHCs. It will also examine government hospitals, private clinics and laboratories to understand how most medical care facilities operate and deal with their waste.

This study will not draw direct comparisons between different facilities. It is to be used only informing personnel of the importance and urgency of proper medical waste disposal. If we are to learn and progress forward, then it is important to learn from each other and understand why there is a complete lack of safe medical waste disposal practices.

Remedial actions will be identified to ensure that future activities adhere to environmental regulations established by the Bangladesh Government and others.

METHODOLOGY

Study Design

The investigation of waste disposal practices of BRAC Health Centres was conducted from December 1996 to March 1997. There are only three districts where BRAC BHCs are located: Bogra, Dinajpur, and Mymensingh. Dinajpur and Mymensingh were selected for this study. Dinajpur was chosen since it is in the region where the first BHC was established in May 1995. Mymensingh was chosen for its proximity to a large urban area. Though there are no BHCs in Dhaka a number of medical facilities were visited, to determine the types of waste management systems in-situ. As well, government hospitals and clinics, private laboratories and clinics were

also visited in Mymensingh and Dinajpur. These visits provided insights to the overall health care systems of Bangladesh.

Data was collected using a three pronged approach: (i) literature review, (ii) field observations, and (iii) interviews. Interviews were conducted with people involved in the generation, handling and disposal of waste. This included doctors, paramedics, aya's, patients, Programme Organizer's (PO's), Shikha Shebikha's (SS's), Village Organizations (VO's), villagers, and lab technicians. Having a wide range of viewpoints allowed for a complete picture of the issue. The questionnaire was designed to be flexible and could be modified depending on the respondents understanding of the issues. Generally questions were geared towards the basic understanding of the respondents.

The questionnaire was designed to focus on two main areas:

- Health and safety,
- Environmental assessment

Field observations were made at each location, using a checklist which focused on potential problems posed by medical waste disposal. The following are the types of problems medical waste pose:

- public nuisance impacts
- public health impacts
- water issues
- air issues
- land issues
- social and cultural issues

Study Sample

A comprehensive investigation was made into the waste disposal practices of fourteen BHC's, four private clinics, four private laboratories, and six government medical facilities. The environmental examinations were conducted in Mymensingh District, Dinajpur District and Dhaka City. Nine BHC's, one government hospital, one private laboratory, and one health and planning centre were visited in Mymensingh. Five BHC's, two private clinics, three government medical facilities, and

one private laboratory were visited in Dinajpur and two medical facilities was visited in Dhaka. The information gathered from structured questionnaires, observations, and checklists were analyzed and recommendations are presented in this report.

Data Collection

Data collection in the field occurred throughout March of 1997. Respondents were interviewed and visual observations were noted with the use of a checklist.

Limitations

Any study involving interviews and visual observations will be prone to biases, which may or may not affect the findings. We have tried to maintain a unbiased outlook when collecting the data and conducting interviews.

During interviews, some respondents seemed try to give us the answers they thought we were looking for, even if it seemed contrary to what other respondents in the same area said or what we observed. However, it is difficult to calculate the extent to which the results of the study may have been affected. In spite of these restrictions, the information presented in this report is believed to maintain a creditable degree of precision in detailing the conditions and circumstances that BHCs face.

STUDY SITE DESCRIPTION

BRAC has eleven health centres in Mymensingh and five in Dinajpur. Nine BHCs were visited in Mymensingh and five were visited in Dinajpur. The facilities available at each centre varied, with some providing delivery services and others having laboratories on site for collecting and analysing sputum, blood, urine, stool, and urine tests by lab technicians. It has to be mentioned that, the BRAC policy currently is to have only one laboratory per thana *i.e.* only one BHC in a thana have a laboratory facilities.

BHCs provide basic and secondary health care for all community members specially women (pregnancy, family planning and other reproductive health problems), children, adolescents and other community members. Referral services for complications and emergencies in pregnancy, family planning, TB, pneumonia and other aspects related to the community's health are also available at the centers.

Apart from BHCs, two government medical hospitals, one in Mymensingh and the other in Dinajpur, and two private clinics, both in Dinajpur, provide laboratory, delivery, and surgery facilities were visited during the study period. The two private laboratories, one in Dinajpur and Mymensingh, deal only with collection, fixation and diagnosis. The table in appendix shows what each medical facility area of operations are (Appendix 3 & 4).

OBSERVATIONS

It is apparent that in all locations visited (including government hospitals, private clinics and laboratories) that there is insufficient awareness of the magnitude of the medical waste issue by health care workers and their beneficiaries. Recently BHC has made efforts to address this issue; either alone or in combination, a variety of methods were used by the medical facilities to dispose of waste. These included burning, burial, entombing, selling, dumping, and removal by municipal bins. The appendixes (Appendix 5 & 6) is a summary of waste disposal practices of BHCs, Government hospitals and clinics, private clinics and laboratories. In each category, a description of the waste disposal activities are outlined.

BRAC Health Centres

The health centres that dealt with either deliveries or laboratory facilities or both caused the most concern during the investigation. These are the centres which produce hazardous and pathological waste. Placenta, syringes, needles, sputum pots, chemical agents are all potential areas of concern. Most centres would burn infectious waste which was contained in plastic containers i.e. sputum pots and polyethylene bags and bury the ash. Placenta, needles, syringes, cotton bandages,

sanitary napkins in most cases were disposed of in concrete ringed pits. However, the centres which did not have concrete ringed pits (only if have delivery services) removed the needles from the syringes. Syringes were burned and the needles would be buried. The burial of needles usually occurred in no fixed area. Waste was burnt in open pits behind the clinic facilities. The ash from the pits would then be removed and buried in the ground, and there was rarely a fixed location. Only Mymensingh has concrete ringed pits installed fairly recently. There is no such disposal concrete pits in Dinajpur.

In some of the centres visited, empty packets and wrappers from medicines could be seen scattered outside of windows and around the perimeter of the centre. It was seen also in private clinic and hospitals.

The medical laboratories at examine blood, stool, urine, and sputum. The chemicals used for the staining and preservation of slides and for the sterilization and cleaning of equipment and surroundings are potentially harmful to the laboratory technician and the environment. Most of the chemicals are poured down the sink and drain out next to the clinic. Children, adults, and animals all have the potential to come into contact with these chemicals. Xylene, phenol, methylene blue, hydrochloric acid, chlorine and carbol fuchsin are all used in BHC's, and some can have very damaging effects. Their properties, effects, and uses are outlined in Table 1.

There has been no formal training of staff, to teach them how to deal with the disposal of medical wastes though they have received training on laboratory analysis, it is done in an adhoc method. Medical officers are generally aware that medical waste could pose a problem, however most thought they were handling the situation sufficiently. Paramedics, nurses, and aya's, however, had no training (formal or non-formal) on handling procedures and disposal methods.

Table 1. Types of chemicals used in medical facilities and their uses and effects.

(Allowable concentration was not available during this study)

Chemical	Use in Laboratory	Properties	Potential Effects
Xylene	removal of seederwood oil for TB slides	toxic	<ul style="list-style-type: none"> • inhalation of vapours can cause: headaches; euphoria; light-headedness; dizziness, drowsiness; nausea • vapour can irritate skin, eyes, and lungs • over exposure can lead to irregular heart beat, fainting, and eventually death
Phenol	disinfectant and sterilizer	corrosive combustible poisonous (maximum admissible concentration is 0.5 ug/l)	<ul style="list-style-type: none"> • can cause severe burning to skin, eyes or lungs if contact made • can seriously affect lungs and respiratory system in inhaled (pulmonary edema, lung inflammation) • potentially fatal • ingestion causes nausea, vomiting, gastro-intestinal irritation and bleeding • over exposure can lead to kidney and liver damage
Carbol Fuchsin	fixing of sputum slides	corrosive poisonous	<ul style="list-style-type: none"> • readily absorbed and can cause severe burning if brought into contact with skin/eyes/lungs • inhalation results in chest pains, increased heart rate, coughing, nose and throat irritation, convulsions, and eventually death
Hydrochloric Acid	fixing of sputum slides	corrosive poisonous	<ul style="list-style-type: none"> • may cause burning sensation if brought into contact with skin/eyes • inhalation causes coughing/restricts breathing and damage to upper respiratory

			system
Methylene Blue	fixing of blood & sputum slides		<ul style="list-style-type: none"> • can cause damage if brought into contact with eyes, skin, clothing
Chlorine	negative slides soaked before disposal		<ul style="list-style-type: none"> • not available information
Paraffin Wax	preservation of TB slide		<ul style="list-style-type: none"> • not available information
Benedict Solution	fixing of urine slides		<ul style="list-style-type: none"> • not available information

Source: NWFSC MSDS Search (amount of chemicals was not mentioned in this reference)

HEALTH AND ENVIRONMENTAL ASSESSMENT

Laboratory Waste

The following are environmental and health impacts which are associated with laboratory waste:

- accumulation of toxic chemicals within soil (proximity to agricultural fields, humans, soil organisms, wildlife, cattle)
- ground water contamination, decrease in water quality
- persistent in the environment
- bio-accumulation in organism's fat tissues, and biomagnify through the food chain
- repeated and indiscriminate application of chemicals over a long period of time has serious adverse effects on soil microbial population - reducing the rate of decomposition, and generally lowering the soil fertility. (Genvieve, 1996)
- pathogens leads to long term accumulation of toxic substances in the soil
- degradation of soil fertility
- degradation of habitat
- specimens collected for analysis have the potential to cause disease and illness in man, either through direct contact or indirectly by contamination of soil, groundwater, surface water, and air
- wind blown dusts from indiscriminately dumping also have the potential to carry and hazardous materials
- with domestic animals being allowed to graze in open dumps, there is the added risk of reintroducing pathogenic micro-organisms into the food chain.

Delivery Waste

The following are environmental and health impacts which are associated with delivery waste:

- public nuisance
- ground water contamination, decrease in water quality

- degradation of habitat
- improper sterilization of instruments used in labour room may cause infection to mother and child
- combination of both degradable and non-degradable waste increase the rate of habitat destruction due to the increasing the number of sites necessary for disposal of wastes.

Tuberculosis Waste

The following are environmental and health impacts which are associated with tuberculosis waste:

- poly-bags, sputum pots, gloves, if not properly destroyed may contaminate the soil and also reduces the chance for water percolation into the soil during precipitation.
- Open air burning does not guarantee proper incineration, and releases toxic fumes into the atmosphere from the burning of plastics i.e., PCB's. Having an incinerator also avoids the disposal of non-biodegradable waste being placed into the concrete pits.

DISCUSSIONS AND CONCLUSION

The overall findings indicate that there is a need to improve medical waste handling and disposal methods. This is necessary not only at BRAC Health Centres but at government hospitals, private laboratories, and clinics as well. In most government hospitals, private laboratories, and clinics waste is disposed in municipal bins without proper regard to the harmful effects they may pose to human health and the environment. They do not have any waste disposal system in place to manage their medical waste. Most BHCs visited believed that they were disposing of their waste in an appropriate manner. Though some BHCs medical officers did show their concern and generally wanted to improve the situation. Most patients and lower trained health care workers have only a basic understanding of health care and don't perceive handling or disposal of medial waste as a hazard at all.

Methods have been recommended and outlined on how to handle and dispose of the most serious chemicals and pathological waste. These recommendations place a minimum impact to both

human health and the environment. It is unfortunate that the economic costs associated with implementing waste disposal systems have the potential to become astronomical, however the methods outlined below should place a minimal cost to BRAC. It should be in our utmost concern to change the present practices and implement the recommendations. Only in this way can sustainable health care can result.

RECOMMENDATIONS

What can be done immediately

1. **Awareness and Education:** It was observed that there is a lack of awareness by health care workers of the danger of medial waste. To rectify this, training seminars/and in-house training should be conducted by BRAC, to clarify what dangers exist, and the proper methods of handling and disposal.
2. **Close monitoring of existing practices:** It was found that the staff and workers at BHCs are not properly following the guide line provided by the programme. Such as; use of gloves, musk, effective burning of sputum pot. Therefore, it is necessary to monitor the existing practices. There is need to do the revision of the guide line to see whether it is enough or not.
3. **Planned Disposal Sites:** Need for better planning of burial sites. Records of all waste buried, and location of burial should be kept/maintained for monitoring purposes.
4. **Separate Concrete Pit Chamber:**
 - (a) Concrete Pit Chambers for disposal of biodegradable wastes need to be established at BHCs in Dinajpur Region.
 - (b) Placenta and other biodegradable materials should be disposed of in a separate pit, instead of being combined with other hazardous, but non-biodegradable material.

5. **Elimination of Xylene at BRAC's Health Centre's:** Seederwood is used in health centres for TB slides. This oil is removed from TB slides by Xylene. Liquid paraffin, however can perform the same task as seederwood oil. Paraffin is non-toxic, volatile and is widely used by private clinics and hospitals. We recommend replacing seederwood with liquid paraffin. This way we can avoid the use of Xylene.
6. **Biohazard Bags:** The use of biohazard bags is recommended by the U S Army Medical Centre, to contain medical waste prior to disposal. The use of these bags avoids unnecessary exposure of hazardous waste to both health workers and the environment. It also enforces the message to workers that these types of medial waste are hazardous, and require careful treatment and handling. Any kind of bag with clear marking (e.g. one for degradable, other for metallic, and another for plastic) can be use for this purpose.
7. **Expansion of Investigation:** To continue the efforts of the EG and move the investigation from a pilot project into a national level investigation. The investigation has to be done to find out the amount of chemicals used in hospitals and laboratory which may pause potential effects on health and environment.
8. **Risk allowance for the staff:** Exposure to the toxic chemicals and contagious samples can harm the person who is handling it. Specially for laboratory technicians and POs, PAs, SSs dealing with TB patients all run to the risk of contamination. There should be a periodic allowance (money) for their health and safety issue.

Future recommendations

1. **Elimination of Phenol at BRAC Health Centres:**
 - (a) Phenol is currently used as a disinfectant, but could be replaced by other less harmful disinfectants such as Dettol.
 - (b) The use of an autoclave machine for the proper sterilization of instruments is also recommended to avoid phenol use.

2. **Incinerator:** A self contained incinerator, which burns hazardous waste efficiently, would be a better alternative to the current use of open air pits. Open air burning does not guarantee proper incineration, and releases toxic fumes into the atmosphere from the burning of plastics i.e., PCB's. Having an incinerator also avoids the disposal of non-biodegradable waste being placed into the concrete pits and prevents the dispersal of ash by the wind.
3. **Treatment facility:** low-cost water treatment system should be introduced to reduce the environmental and health risk of laboratory waste water of BHCs.

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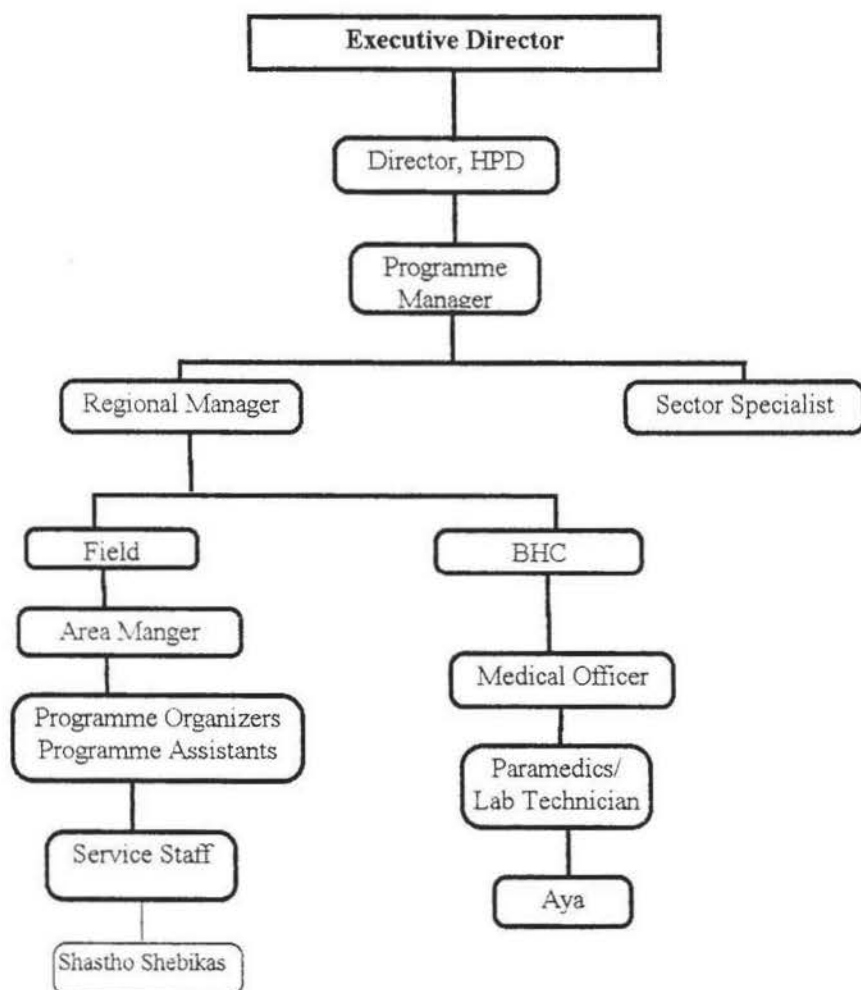
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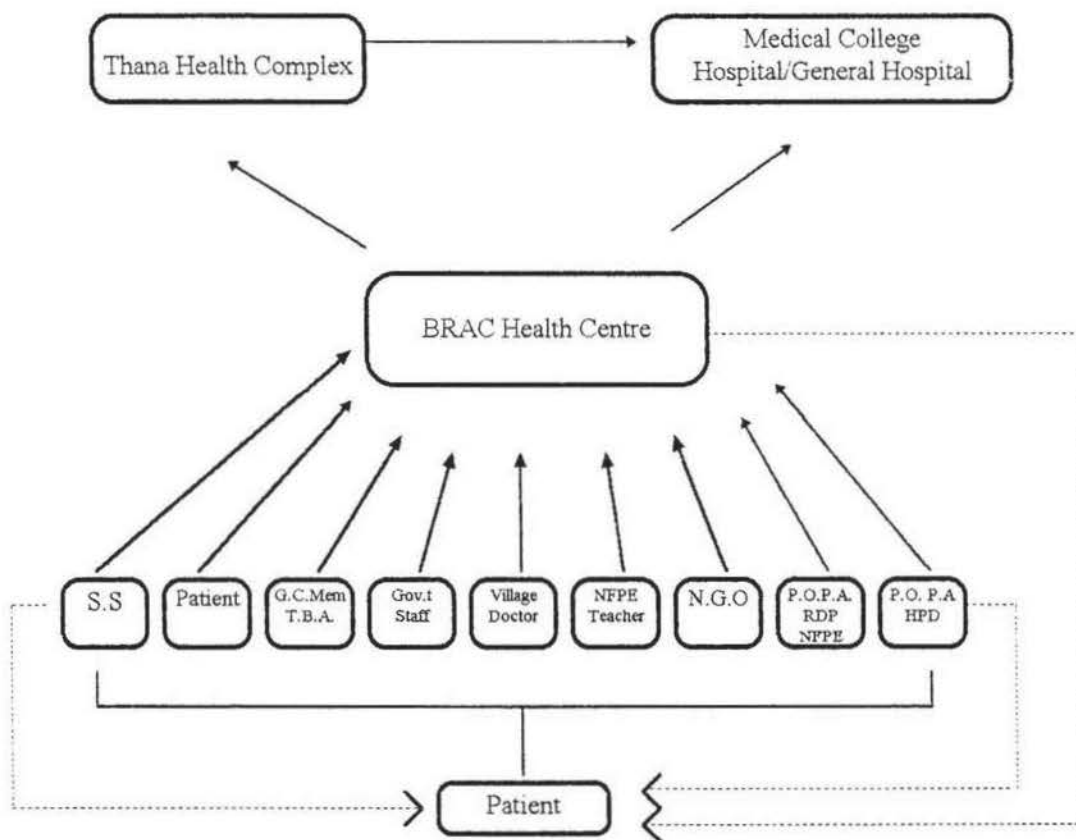
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APPENDIX

Appendix 1. BRAC's Health Structure



Appendix 2. BRACH Health Centre Patient Referral System
 (Source: Mymensingh HPD Regional office)



Appendix 3. Medical Facilities offered by BHCs, Government and Private Clinics, Hospitals and Laboratories in Mymensingh.

Medical Facility	Laboratory	Delivery	Surgery
Chechua (BHC)	yes	yes	no
Phulpur (BHC)	yes	no	no
Gouripur (BHC)	no	no	no
Gabtohi (BHC)	yes	yes	no
Boiler (BHC)	yes	yes	no
Tarakanda (BHC)	no	yes	no
Trishal (BHC)	yes	no	no
Shambhugunj (BHC)	yes	yes	no
Paratungi Office (BHC) disposal site	no	no	no
Mymensingh Medical College Hospital	yes	yes	yes
Rupshi Government Health and Planning Centre	no	no	no
Dankarif's Diagnostic Centre (Private Lab)	yes	no	no

Appendix 4. Medical Facilities offered by BHCs, Government and Private Clinics, Hospitals and Laboratories in Dinajpur.

Medical Facility	Laboratory	Delivery	Surgery
Seven Day Clinic (Private Lab)	yes	yes	yes
Rogmukti Clinic (Private)	yes	yes	yes
TB Clinic (government)	yes	no	no
Doctors Pathology (Private)	yes	no	no
Dinajpur Sadar (BHC)	yes	yes	no
Fulburi (BHC)	yes	no	no
Vobhanipur (BHC)	no	yes	no
Ranigonj (BHC)	yes	yes	no
Parbatipur Area Office (BHC)	yes	no	no
Parbatipur Thana Health Complex	yes	yes	no

Appendix 5. Disposal methods and types of waste in Mymensingh Medical Facilities

Medical Facility	Burned	Buried	Sold	Concrete Pit	Municipal Bin	Dumped
Chechua (BHC)	gloves sputum pots	slides	-----	syringes needles	-----	-----
Phulpur (BHC)	syringes sputum pots poly-bags	slides needles	-----	-----	-----	-----
Gouripur (BHC)	-----	-----	-----	-----	all waste	-----
Gabtolli (BHC)	-----	syringe slides cotton	-----	gauze bandages placenta	-----	-----
Boiler (BHC)	syringes needles slides	ash slides	-----	delivery waste	-----	-----
Tarakanda (BHC)	sputum pots	-----	-----	syringes needles cotton gauze medicine packets placenta	-----	waste paper medicine packets
Trishal (BHC)	sputum pots poly-bag syringes	slides needles stool pots	-----	-----	-----	waste paper medicine packets
Shambhug unj (BHC)	-----	TB slides	-----	delivery waste	-----	waste paper medicine packets

Cont. appendix 5

Medical Facility	Burned	Buried	Sold	Concrete Pit	Municipal Bin	Dumped
Paratungi Office (BHC disposal site)	-----	sputum slides	-----	-----	-----	waste paper
Mymensingh Medical College Hospital (Gov. Hospital)	bed sheets mattresses sputum pots	-----	saline bags ampoules vials x-ray water plastic bottles	-----	TB slides	TB slides waste paper medicine packets
Rupshi Govt. Health & Planning Centre	-----	all waste	-----	-----	-----	-----
Dankari's Diagnostic Centre (Private Lab)	-----	-----	-----	-----	all waste	-----

Appendix 6. Disposal methods and types of waste in Dinajpur Medical Facilities

Medical Facility	Burned	Buried	Sold	Concrete Pit	Municipal Bin	Dumped
Seven Day Clinic (Private)	syringes needles cotton gauze	body parts placenta	saline bags	-----	plastic & paper waste	-----
Rognukti Clinic (Private)	-----	-----	x-ray water	-----	syringes needles cotton bandages	sanitary pads placenta
TB Clinic (government)	sputum pots	slides	-----	-----	-----	plastic & paper waste
Doctors Pathology (Private)	syringes cotton bandages	syringes cotton	-----	-----	-----	-----
Dinajpur Medical College Hospital (government)	cotton bandages	placenta pathological waste	plastic bottles saline bags syringes x-ray water ampoules vials	-----	other plastic & paper wastes not sold	-----
Dinajpur Sadar (BHC)	sputum pots	ash slides	-----	delivery waste	-----	-----
Fulburi (BHC)	cotton paper syringes	glassware placenta sputum slides	-----	-----	-----	-----

Cont. appendix 6

Medical Facility	Burned	Buried	Sold	Concrete Pit	Municipal Bin	Dumped
Vobhanipur (BHC)	sputum pots poly-bag syringes	slides needles stool pots syringes delivery waste	-----	-----	-----	waste paper medicine packets
Ranigonj (BHC)	syringes needles ampoules vials urine & stool pots	placenta	-----	-----	-----	waste paper medicine packets
Parbatipur Area Office (BHC)	sputum slides	sputum pots	-----	-----	cotton stool pots bottles plastic	waste paper
Parbatipur Thana Health Complex (government)	syringes delivery waste	ash from burning	saline bags ampoules vials x-ray water plastic bottles	-----	-----	-----