

**HEALTH IMPACT OF WATER SUPPLY AND  
SANITATION INTERVENTION IN  
MEHERPUR POURASHAVA**



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MEHERPUR POURASHAVA**

**A PROJECT THESIS  
BY  
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# HEALTH IMPACT OF WATER SUPPLY AND SANITATION INTERVENTION IN MEHERPUR POURASHAVA

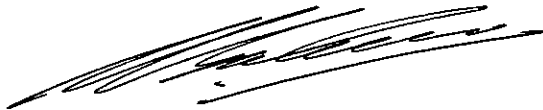
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## DECLARATION

I hereby certify that the project work embodied in this report has been performed by the author under the supervision of Dr. M. Feroze Ahmed, Professor the Department of Civil Engineering, BUET. Neither this work nor any part of it has been submitted or is being concurrently submitted else where for any other purpose (except for publications).

June, 1997

  
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## ABSTRACT

A Dutch aided project, under the Netherlands-Bangladesh development Co-operation, has been in operation in Mehrpur pourashava since July 1994. This study present an assessment of the impacts of the on-going water supply, drainage & sanitation activities on the health situation of the poura-people, investigation, into the present population coverage by project's components and some recommendations for the improvement of the project's components, which may improve the health situation of the people further.

Though some rehabilitation and new construction works under water supply have been done under the project, Meherpur town is still facing with drinking water problem. Initially the project's objectives were to ensure 75% piped water to the poura-area and rest 25% by ground water through hand tube wells. Within these three years span of time the target has not been fulfilled . Piped water coverage has been achieved to 15.4% only. Moreover, the arsenic content of ground water (100 to 160 microgram per liter) is an emerging problem for which arsenic removal plant is going to be installed soon. With the arsenic treatment plant, an over head tank is also going to be installed. For total coverage by treated water, more production tube wells, over head tank, pipe lines etc. are essential.

The investigation has been made on the present trend of drainage system of Meherpur town. The old drains have been rehabilitated and some new drains have been constructed with a view to evacuate all the waste water from the town but the town is still facing water logging problem. The total drainage system has been investigated to find out the ways of easy drain out of all rain / waste water from the poura area. The investigation has been made to assess the sanitation facilities within the poura-area. The projects target was to ensure proper sanitation facilities to the poura-people. Some low cost sanitary latrines were distributed within these three years time span of project but the area is still facing a big sanitation problems. Hygiene education is an integral part of the project and the target was to improve the total system by increasing people's awareness through hygiene education.

Investigation has been made on incidences waterborne diseases in Meherpur town as an indicator to change in health situation. In spite of poor water supply and sanitation coverage some improvement has been found through the study of secondary data available with the sadar hospital, Mother & Child welfare centre & thana health office (Pourashava section). Full implementation of all the project components and increase in the population coverage are expected to further improve the health situation in the Paura Area.

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## LIST OF ABBREVIATIONS

18 DTP	-	18 District Town Project
PTW	-	Production Tube Well
OHT	-	Over Head Tank
ARP	-	Arsenic Removal Plant
CSC	-	Community Sanitation Center
PCS	-	Pourashava Conservancy Section
WSSC	-	Water Supply & Sanitation Committee
PWSS	-	Pourashava Water Supply Section
DPHE	-	Department of Public Health Engineering
XEN	-	Executive Engineer
SDE	-	Sub-Divisional Engineer
SAE	-	Sub-Assistant Engineer
WA	-	Work Assistant

## CHAPTER-1 INTRODUCTION



### GENERAL:

Improved water supply, sanitation, and hygiene education is necessary to improve the health situation of the people. With a view to improve the health condition of the poura people, the Netherlands - Bangladesh Development Co-operation has started a package type programme like water supply, sanitation & hygiene education activities under 18 District Town Project- 18 DTP in Meherpur town in 1994. The project's intervention through the water supply, sanitation & hygiene education has been done by the physical works like, rehabilitation & construction of infrastructures related to water supply, drainage & sanitation. The soft aspect like hygiene education has also been integrated with water supply & sanitation and given to the poura-people. The prevalence of waterborne diseases has not yet shown significant improvement after intervention.

There are so many projects running in Bangladesh, funded by donor agencies, but there is no proper mid term evaluation being done. The present condition of Meherpur pourashava with the project's intervention and thus the development in the fields of water supply, sanitation & hygiene education etc. have been studied and the impacts have been verified. Some future development & recommendations have been made through this study. The present data on waterborne diseases & hygiene practices, reveals that, the total project works are needed to be reviewed in the context of project's objectives.

## 1.1. Health Impacts of water Supply and Sanitation:

The better water supplies may help to control the waterborne diseases. The feco-oral infections (waterborne) are of greatest worldwide public health importance. These infections can be transmitted by any means through which fecal material from one person enters the mouth of another. The group includes not only the notorious scourges of cholera and typhoid, but also the diarrhoeal disease caused by many less well known microorganisms. This latter group of diseases is common among poor communities, particularly among young children. It has been estimated (Synder and Merson 1982) that each year these diseases cause more than 5 million deaths among children under 5 years of age in the developing world. They also contribute to widespread malnutrition and place a heavy burden on health services. Although adults suffer from them less frequently, diarrheal diseases can remain an important cause of mortality well into adult life (Gordon et al. 1964).

Although it has long been known that feco-oral infections can be transmitted by the waterborne route particularly in epidemics, they also be transmitted by contaminated food, utensils, hands (Khan,1982), and even cloths (Stanton and Clemens,1986). In other words, they can be transmitted by a variety of routes that are facilitated under condition of poor domestic hygiene. Although waterborne transmission can be prevented by improved water quality, these other routes are more likely to be controlled by better access to water in quantity and are therefore water-washed. It appears that, in many settings, most of the endemic transmission of diarrhoeal disease is not water borne but waterwashed. Indeed, in most of the health impact studies, in which a significant reduction in diarrhea diseases was detailed, there had been improved access to water in quantity (Esrey and Habicht,1986). In many of the studies that failed to detect an impact, only the water quality had been improved.

It has also been suggested that the availability of clean water on it's own may not be sufficient to bring about health benefits unless it is accompanied by other interventions to improve the way in which it is used, and the environment in which that use takes place (WHO 1981). A more significant health impact might be expected to stem from a program in which water supply is combined with health education to ensure that the available water is fully used for hygienic purposes, and with improved excreta disposal to minimize fecal contamination of the domestic environment:

## 1.2. THE PROJECT:

**Water Supply:** The project has been in operation since July 1994, with two production tube wells and 10.5 km. pipe lines & with 300 house connections. Rehabilitation of old PTW & pipe lines was done and in addition, 7 km. pipe lines were constructed and house connections have been increased to 720 (upto June, 1997). Through these limited development of infrastructures, the project's targets have not been fulfilled. Additionally, due to arsenic problem, it has become essential to provide arsenic free water to all poura-people. There are four thousand households at present, and only about 15.4% coverage has been achieved.

**Drainage:** Initially there were 2.8 km. drains of poor quality which were consequently rehabilitated under the project. About 7.5 km. new drains has been constructed. The evacuation of total waste water is not being possible through these 10.3 km. drains. Most of the drains are with larger cross-section and were designed to evacuate the flood water considering the flood of 1988 in Bangladesh. But this condition is not feasible for Meherpur town. Meherpur town was not flooded in 1988 even. Most of the drains are of larger cross-section, depth of which ranges from 0.5 m to 1.5 m and having no cover even in some crowded areas. Peoples, sometimes, throw solid wastes into the drains, as a result, waste hazards & waste water logging occur frequently. Inter linkage between the drains has not been done properly. Also, there is no drain in some built up areas, as a result, the people are facing water logging problem. Proper inter - linkage among the drains, some road side shallow depth drains in the built up areas are essential to evacuate total rain/waste water.

**Solid Waste Management:** The solid waste management system is very poor in Meherpur pourashava. Solid wastes are collected irregularly and are dumped into a low lying area outside the city in an unplanned way. There were some small dust bins, capacity of each is about 0.3 cum. to deposit the household wastes, most of



which are damaged. Only 8 number of dust bins, each of capacity 1.25 cum. has been constructed under the project. The people sometimes throw their wastes to the drains also. They also, sometimes, dump their wastes to open places causing serious hazards. Regular cleaning of drains, dust bins, sullage connection from households to the drains, and final disposal of the solid wastes are very much essential.

**Sanitation:** Overall sanitation situation of Meherpur town is in poor condition. It has been learnt that provision of sanitary latrine was a priority to develop the situation. It was decided to distribute 2100 set of low cost sanitary latrines to the poor poura-people. During these three year's span of project period, 2100 sets have been distributed. Till now the sanitation facility is not satisfactory. The project's initiatives was to make awareness in such a way that, (i) the latrines would be distributed to the poorer mass, (ii) Some people would be motivated to purchase low cost latrines, (iii) Poorer mass would construct home made latrines by themselves. The situation has improved but not up to the expectation. The number of low cost latrine beneficiaries has been increased than that was during the pre-project period. Another one thousand latrines are essential to meet up the present demand. On the other hand single pit latrine is not very effective and second pit should be provided to the first pit owners, which was also a target of the project . So, it is essential to distribute 1000 new latrines and 3100 set of second pit to improve the sanitation system.

**Waterborne Diseases:** Though waterborne diseases have been improving, the total achievement in this sector has not yet been reached. The normal waterborne diseases are Diarrhoea, Worm, Dysentery, Skin disease etc. for which water supply, drainage, sanitation & hygiene practices etc. are responsible. Consciousness among the poura people has not yet been grown up to a degree, in the poorer mass. Hygiene practice were almost nil in the pre-project period and those have been increased through hygiene education being given by the CSC group members but still not up to the mark. The use of safe water, safe waste disposal, sanitation

barrier, hygiene practices are the most important factors to boost up the health situation as well as to minimise the waterborne diseases. The project's benefit has been noted from January, 1996. It has been learned from the hospital's statistics that the total numbers of patients suffering from waterborne diseases are 2525 in 1997 (up to June) and 4079 in 1996 which was followed by 12125, 14712 & 9178 in the year 1995, 94 & 93 respectively.

**Hygiene Education:** The hygiene practice in Meherpur pourashava is still in poor condition. One of the main reasons is the economic condition. The poor peoples are not mentally ready to acquire the hygiene education because, they are busy with their primary needs such as food & clothing. The motivation should be developed in such a way that, all the poure-people can change their usual behaviour to hygienic practices.

### **1.3. OBJECTIVES OF THIS STUDY:**

The objective of this research work are:

- a) to assess the appropriateness of various interventions already implemented and are likely to be implemented in Meherpur poure area under the Dutch aided project,
- b) to assess the health impact of the interventions and identify the components those are attributing most towards the improvement of health condition of the poure-people.
- c) to find out the negative impact if any of the infrastructures being implemented under the project.
- d) to indicate the deficiencies of the project and to recommend possible remedial measures.

## CHAPTER-2

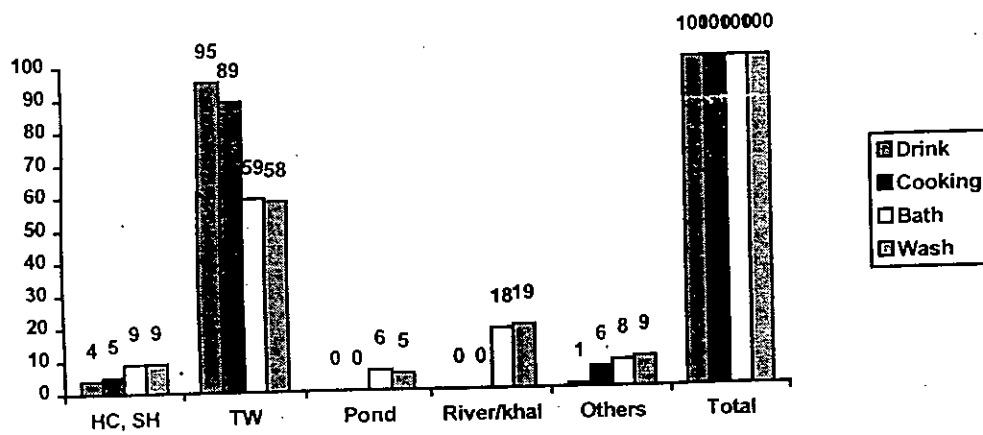
### REVIEW OF EXISTING SITUATION

#### 2.1.WATER SUPPLY SYSTEM:

Use of safe water in all purposes are not found in Meherpur pourashava. The peoples are not being provided with safe water in full. The present habit of the pouira-people are to (i) drink hand tube well water, (ii) Use piped water, for other household activities who have house connections, (iii) use hand tube well water for all activities who have no house connection and (iv) use pond/river water, if available, for washing & bathing. Such condition prevails, because, (a) the piped water is not reliable to them and pipe lines are not cleaned on regular basis, (b) the piped water is not available for 24 hours, (c) Iron & arsenic problems exist in the piped and hand tube well waters, (d) Some people think that the water of hand tube wells are fresh, as they are taking directly but they are not confident on the piped water. It has been confirmed that Meherpur pourashava has been facing arsenic problems with it's ground water. The total areas should be under a centralised water supply system with a piped network for distribution of water. Yard connection, street hydrants, group taps etc. should be installed to meet up 100% coverage with piped water supply to improve the health situation as well.

Before the project's intervention the people used to prefer different water sources for different purposes which is shown in Fig.1 (also in appendix-1).

Fig. 1. Use of diff. sources of water for various purposes



The opinion of poura people about their priority in having service facilities was studied in the Meherpur pourashava. In the feasibility study report it was mentioned that water supply got 41% of first preference, sanitation got 26% as first priority which were followed by drain, electricity, good road and solid waste by 2%, 0%, 4% and 1% respectively

**Hand Tube Well Before the project:** There were 200 number of hand tube wells supplied from pourashava, 1799 numbers by the private owners. In the pre-project period almost all (95%) people used hand tube well water for drinking and most of them are using private tube wells. From the pourashava hand tube wells, about 4 families having a family size of 5.75 persons per family were using a hand tube well water. Some of the hand tube wells were being used by 100 peoples of 26 families. Some of the tube wells become dry up during a part of the year (1-2 month). The people had to queue for getting water from operating tube wells. Iron problems were found acute for most of the tube well water.

**Piped Water Supply:** Before the intervention of the project, there was a piped water supply system, which was operated by DPHE, consisting of two production tube wells. The DPHE-operated piped water supply system which was first commissioned in 1982 with two 150 mm dia production tube wells and 10.5 km of pipe lines under the then 27 - subdivision towns water supply scheme. Water was pumped directly into the distribution system. In total, there were 300 house connections, almost all of them were domestic (95%) of which about 85% were with 0.5 inch dia pipe. There were 19 street hydrants, most of them with taps but without platform and stand post. Now those are abandoned due to lack of long time maintenance. Water was supplied twice a day for about 6 hours. The distribution system had 47 sluice valves. Most of those were covered with soil and sand or were under the roads. There were 15 washout in the distribution system, most of those were not regularly used. As a result, washing and disinfecting of the whole system was never done. At the time of

inventory (for feasibility study) some washouts were opened and found black yellow water were coming out for more than 25 minutes. Leakage was the regular phenomenon which was observed during running condition of the production tube wells. The pressure near pump houses was observed to be 1.5 and 2 kg/sq.m. In almost all pipe lines discharges were measured, either from street hydrants or from taps inside the houses. The measured flows were all between 6 and 25 liters per minute which indicates a low to reasonable pressure in the system. It has been observed that, only 22% of the house connection users use the piped water for drinking, because the water often looks turbid and reddish. About 78% users, use piped water for bathing and only 39% for cooking.

**Development of Water Supply system in Meherpur Town:** Work done under 18 DTP(from 1994-1995) include rehabilitation of a) two existing production tube wells, b) 10.5 Km pipe lines, c) 150 house connections, d) 100 hand tube wells with desanding, resinking & platform providing, e) bleaching wash in every month. New construction works like, a) pump and motor installation, b) pump house, c) electrical works of the pump houses, d) pump driver's quarters, e) 3 Km of pipe line installation, f) 1 Km reticulation line, g) 100 new hand tube wells, h) PWSS office building, i) 200 new house connections, etc. have been done by the project.

Work done from Jan'1996 to June 1997: Rehabilitation of a) pump house back washing/raw hiding, b) 10.5 Km pipe line, c) 140 house connection, d) 100 hand tube wells etc. Construction works like, a) 4 Km pipe lines, b) 1 Km reticulation line, c) 83 hand tube wells, d) 220 house connections, e) 4 nos. street hydrants etc. have been done by the project.

## **2.2. DRAINAGE SYSTEM:**

Meherpur town is situated at the center of the most western part of Bangladesh. It is about 60 Km west of Kushtia and 28 Km of Chuadanga. With both these districts Meherpur is well communicated by road. The town area is within the deltaic plain at

the south-western zone of the country. The average ground level of the town area is 9.5 m (arbitrary) and slopes both westwards & eastwards. The river Bhairab flows north-southwards along the western side of the town. The town area is high enough and was never flooded even in the year 1988. The local rainfall creates pockets/drainage problems in most part of the town because of inadequate drainage system. Storm water from western part of the town somehow gets way through the existing drain. There are about 10.3 Km drains out of which around 7.5 Km has been constructed and 2.8 Km has been rehabilitated from the project (pl. refer to appendix-2). The storm water in the eastern side are accumulated to the nearby paddy fields. Every year the pourashava authority has to cut a few road to make way for storm run-off and solve local drainage problems temporarily.

The busy areas of the pourashava had also been facing with water logging problems. The overall drainage system turned into a crying need for the construction of new drains in Meherpur pourashava.

Within these three years of time span (July' 94 to June' 97), 2.8 Km old drains has been rehabilitated. 7.5 Km more drains has been constructed under the project

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### **2.3. SOLID WASTE MANAGEMENT SYSTEM AT MEHERPUR POURASHAVA:**

The present waste management system of Meherpur pourashava is in the traditional form. Wastes are collected irregularly and dumped in unplanned way.

There were some dustbins which were provided by the pourashava (most of those are in damaged condition). The people used to deposit their wastes here and there causing waste hazards. Some people of the main town dump their wastes into the dust bins, those are collected by pourashava and dumped in the low lying area in unplanned way.

There are one part time sanitary inspector, one conservancy supervisor (jamader), 14 sweepers to keep the system running. Only 8 nos. of dustbins and few old dustbins are being used to gather the wastes. Only one driver & one helper use to collect the wastes with the help of sweepers, transport and then dump those wastes in the low lying areas outside the poura-area.

The CSC group members are engaged to motivate the people to dig & use home made garbage pit. The achievement to this part is very poor due to, (i) normal habit & mentality of the people, (ii) for shortage of land etc. Some times the peoples use to dump their waste to the nearby small ditches, bushes etc. which create environmental sanitation problem in the area.

#### **2.4. SANITATION SYSTEM OF MEHERPUR TOWN:**

Sanitation system is improving but still in poor condition. Most of the houses are with unhygienic latrines. Though some activities have been done in this sector, the achievement in this sector is not up to the desired level. One of the most important criterion for the development of health situation is to improve sanitation and for this act of development, (i) the poor people are needed to be supplied with sanitary latrines and hygiene education, (ii) proper motivational works are needed for the medium & high income group also.

In the pre-project period, population coverage by safe sanitation facilities was found to be 32% and the rest 68% were with unsafe sanitary facilities. A dangerous proportion i.e. 55% were with surface (water) latrines & having no latrine. Seven different types of sanitary facilities or sanitation practices were found at Meherpur. - No latrine, -Surface (water) latrines, -Service or bucket latrines, -Pit latrines, -Sanitary pit latrines, -Twin pit latrines and -Septic tank.

Total 2100 set of low-cost sanitary latrines, 3- school latrines, 2- community latrines, 8- dust bins, etc. were constructed under the project.



## CHAPTER-3

### FUTURE DEVELOPMENT PROGRAM

#### 3.1. WATER SUPPLY SYSTEM:

Depending on the pre-project period and post-project period, some program has been planned to implement in future.

**Production tube well:** Two more production tube wells will be constructed from the project in the financial year 1997-98. It has been decided to increase the supply hours from 12 hours to 24 hours.

**Hand Tube Well:** Before starting the project, there were 200 public hand tube wells in the pourashava and 1799 private hand tube wells were in working condition. 183 more hand tube wells has been installed from the pourashava during the project period. After completion of arsenic removal plant, all the hand tube wells will be replaced by piped water (group tap) and already 150 group taps has been designed to implement.

**Arsenic Removal Plant & Over Head Tank:** The investigation has been made on the ground water of Meherpur and found that arsenic content is quite high which ranges from 100 to 160 micron per liter (water quality investigation report, Netherlands). So, an arsenic removal plant will be constructed soon. Four production tube well's water will be fed into the plant and water will be stored in a over head tank. After installation of the arsenic removal plant 100% population will be served.

**Pipe Line:** There were about 10.5 Km pipe lines which have been rehabilitated and 7 Km more pipe lines have been installed under the project. To meet up present increasing demand, 6 Km more pipe lines have been designed to be installed in the financial year 1997-98.

**Reticulation Line:** About one kilo meter reticulation line has been installed under the project and 4 Km more reticulation line will be installed in the following financial year.

**House Connection:** The 18 DTP was started with 300 house connections. The old house connections has been rehabilitated and at the same time 420 new house connections have been made under the project. The project has a target to make the total house connection to at least 1120 in the next financial year.

### **3.2.DRAINAGE:**

It has been decided not to construct any more drains within Meherpur pourashava from the project's fund . The project has been initiated a poura conservancy section- PCS, through which regular activities like, Drain cleaning, Road cleaning, Regular campaign for cleanliness, Mosquito destroying etc. activities are decided to be done.

### **3.3. SANITATION:**

In future, 5 more community latrines, 75 dust bins, 10 more school latrines, 1000 more low cost sanitary latrines will be constructed and every single pit will be transferred to double pit (3100 sets more) to fulfil the total demand of sanitation

### **3.4. HYGIENE EDUCATION:**

Hygiene education is an integral part of the project. A community sanitation center- CSC, has been formed who are responsible for hygiene education to the poura-people. The CSC has been giving much effort to improve the health condition and

position of the women. The project attempted to promote women development in a number of disciplines like: (i) tube well caretakers, (ii) tube well beneficiaries, (iii) latrine beneficiaries, (iv) school children and (v) the common people of the pourashava specially the poorer mass. The CSC health promoters & educators have been selecting the latrine beneficiaries and helping to supply low cost latrines to the poor people.

Too many messages has been given to the people and those are: i) to clean the latrines, ii) to clean the drains, iii) to deposit the wastes in the dust bin/home made latrines, iv)to make sludge connection with the existing drains, v) to make home made latrines, at least, upto the period of supply from the project, vi) to detect the leakage in the water supply system, vii) to make house connection in a proper way, viii) to increase house connection, ix) to deposit the water tariff timely, x) to grow awareness for maintaining personal hygiene, xi) to help the PWSS & PCS to make the system workable and sustainable, xii) any activities related to public health.

## CHAPTER-4

### FIELD STUDY, DATA COLLECTION AND ANALYSIS

#### 4.1. WATER SUPPLY

There are 383 public hand tube well and around 2000 private hand tube wells in Meherpur town. Most of the tube wells are without platform.

The DPHE-operated piped water supply system of Meherpur was first commissioned in 1982 with two 150 mm dia production tube wells and 10.5 km of pipe lines under the 27 - subdivision towns water supply project. Rehabilitation/ new construction works has been done in the system like installation of production tube well, pipe line, reticulation line, hand tube well, street hydrant, house connection etc. Now there are 720 house connections, 4 street hydrants etc. are serving the people from 17.5 Km pipe lines. Also the people are being served from 383 pourashava hand tube wells installed under the project. The production tube wells and pipe networks are shown in fig. 4.1.

Investigation has been made on the ground water quality of Meherpur and found that arsenic content is quite high (100 to 160 micron per liter). So, an arsenic removal plant will be constructed soon.

The water supply system is in poor condition. An investigation was made on 300 households (100 in each of three wards) and the present waster supply status of these three wards found from the investigation has been shown in table 4.1.

Fig.4.1. Map showing pipe lines and Production Tube Well

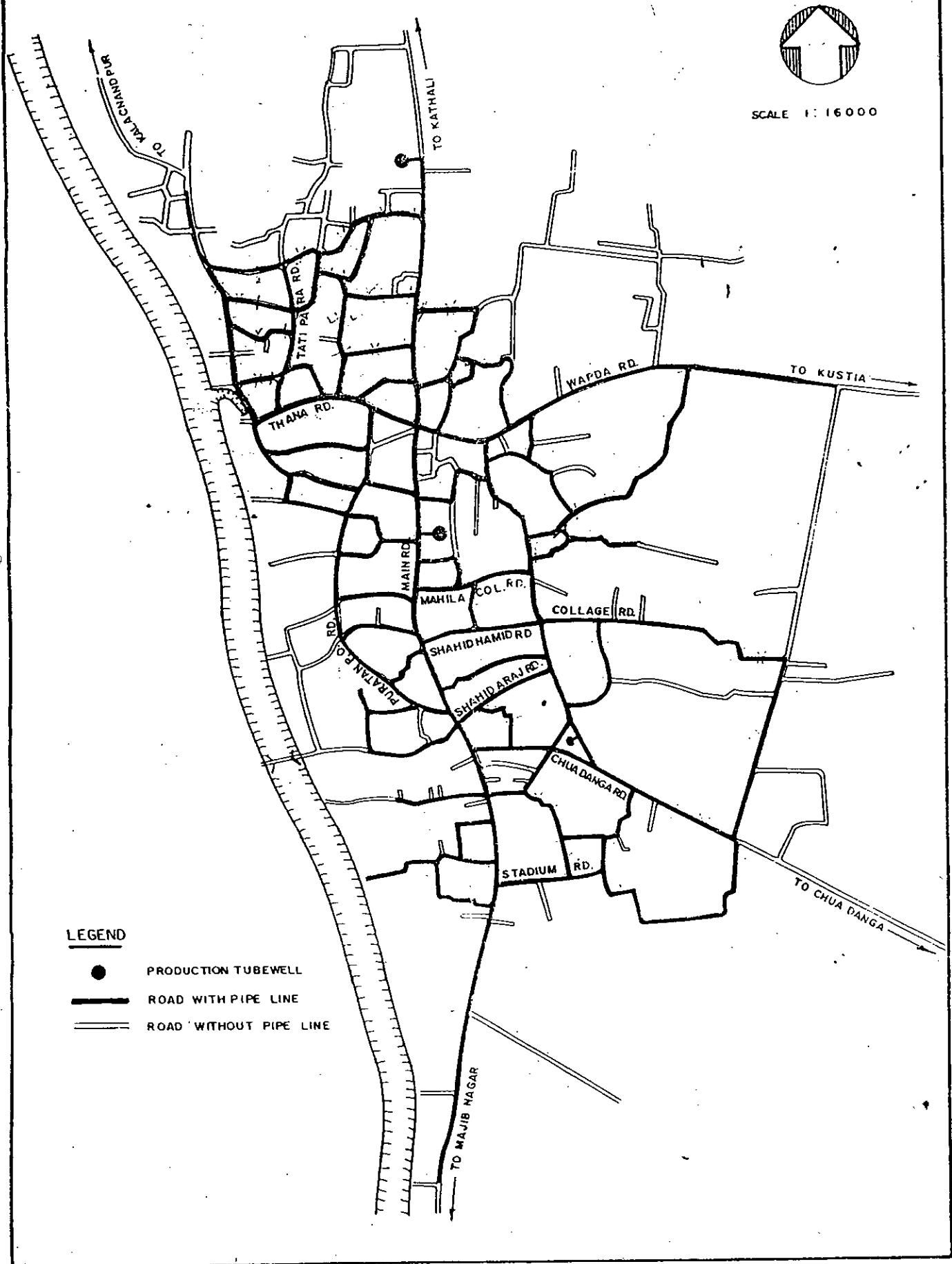


Table 4.1. Water supply status of Meherpur Town:

Ward	Household visited	Piped water	HTW water	No facility
ward no. 1	100	20	76	25
ward no. 2	100	9	77	22
ward no. 3	100	0	53	47
Total	300	29	206	94

The above table reveals that only 20% households are being served from piped water supply in ward no. 1 which is followed by 9% in ward no. 2 and 0% in ward no. 3. The ward 3 is within the fringe area and wards 2 & 1 are in the core area. The table also reveals that about 31% households have neither HTW nor piped water facility. So, the water supply status is very poor in the town (pl. refer to Appendix-3).

#### 4.1.1. DISCUSSION:

Both the hand tube well & piped waters contain arsenic and iron which are acute water quality problem in Meherpur pourashava. Most of the hand tube wells are without platform. On the other hand, the piped water is not cleaned on regular basis. To minimise the waterborne diseases as well as to improve the health situation, pure water supply is essential.

**Arsenic Removal Plant:** An arsenic removal plant has been designed to be implemented. The people are expected to be provided with arsenic free water after one year. Arsenic removal process should remove iron to some extent. Before the installation of iron/ arsenic removal plant, the poura people can practice simple iron removal method. The system is, (i) to pour water into a clean jar from a certain height, (ii) stir the water upto 2-3 minutes, (iii) allow the water to at rest upto 12 hours, (iv) start to drink the settled cleaned water when dissolved ferrous oxide turns

into ferric oxide arsenic is adsorbed at the surfaces of the ferric oxides. Thus iron removal will also remove arsenic from drinking water to certain extent. The people who are facing mal-nutrition are normally more vulnerable to arsenic contamination.

**Pipe Line System:** All the poura-area should be under piped water supply system i.e. house connection should be increased to cover total pourashava under pipe line system.

**Hand Tube Well:** All the hand tube wells should be provided with platform. These platforms will be used as the platforms for group tap because with the completion of ARP, all or most of the tube wells will be replaced by group taps. Consideration is being given for the installation of group tap specially for the poor people. This means 3-5 poor families will use one group tap.

**Street Hydrants:** Now only 4 street hydrants are in running condition which has been implemented under the project. The street hydrants are of moon pump type, i.e. one reserved tank with a hand pump. Piped water is accumulated in the reservoir and water is extracted by hand pump like a hand tube well. After construction of ARP, many street hydrants will be needed to be installed in places like, school, market places, public places etc.

**Water Tariff:** Water tariff before the project was Tk. 20 per 0.5 inch house connection per month. The tariff for the same was increased to Tk. 40 which will continue upto June 1997. The tariff for 0.5 inch house connection has been fixed at Tk. 60 from July 1997. To make the water supply sustainable, water tariff is needed to be increased to meet up the operation & maintenance cost for the ARP. The water tariff should be in such a way that, (a) the tariff will be high for the high income group, (b) for medium income group, two families may be provided with connection, they will pay one connection fees, (c) For the poor income group, 4-5 families may be tied up with one connection and they will pay accordingly, which will be like a group tap connection. (d) The pourashava administration and the CSC group

members will find out the beneficiaries for group taps. About 3-5 families will be served by one group tap and they will pay combinedly the fees for one house connection. (e) A normal water tax will be collected by the pourashava but this amount will be kept with pourashava's own fund. This tax amount shall be given to the PWSS for operation & maintenance cost.

#### **4.2. DRAINAGE SYSTEM**

In the pre-project period, there were about 2.8 Km drains which was maintained badly. In Meherpur town, drain is required to evacuate all the household waste water and rain water. Within the project period 2.8 km drains have been rehabilitated and 7.5 km. new drains have been constructed. Most of the drains are facing with water logging problem for, (i) dumping the waste/garbage into the drains, (ii) improper way of cleaning, (iii) lack of interlinkage between the drains etc. Most of the built-up areas are also facing water logging problem and pockets create after a rainfall. The drains, water pockets, dirty places etc. are shown in fig. 4.2.

There are 10.3 km. drains in the town areas, depth of which ranges from 0.5 m to 1.5 m. Most of drains are without cover even in some crowded areas. Peoples use to through their wastes/garbage into the drains which causes water logging. The drains are not cleaned regularly/ properly as a result hazards occur.

The sullage connection system is very poor in the town. The CSC group members are engaged to promote sullage connection from household to the drains. The promotional activities and sullage connection are not yet complete. As a result the surrounding areas are facing with hazards of improper sullage disposal. An investigation has been made recently and 300 households were visited (100 households per ward). The data shown in table 4.2. give an idea on sullage connection status of Meherpur town.



Fig. 4.2. Map showing Dirty places, Dust bins – proposed/existing

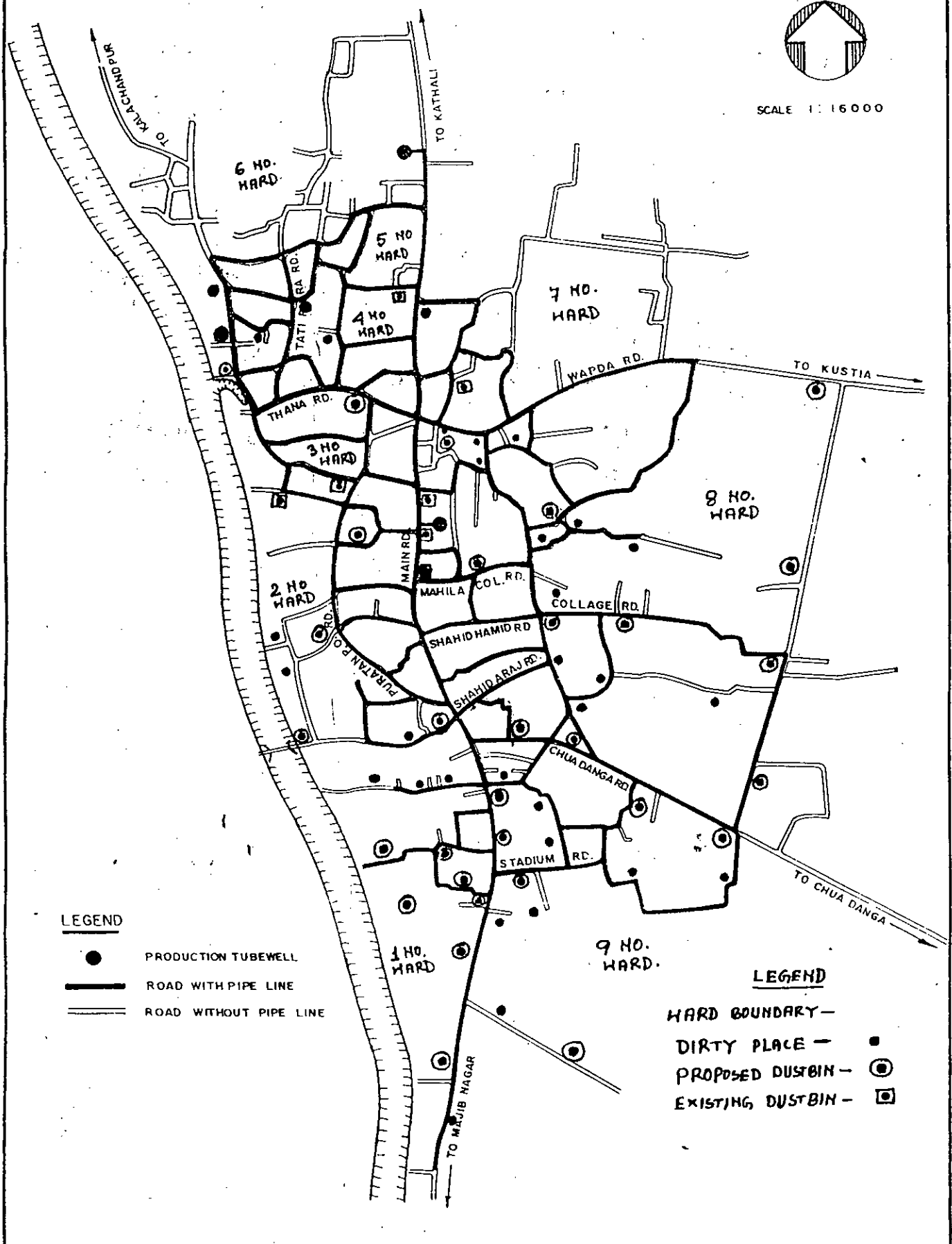


Table 4.2. Sullage connection status of Meherpur pourashava.

Wards	Households visited	Sullage connection with drain	Improper means
ward 1	100	22	78
ward 2	100	14	86
ward 3	100	35	65
Total	300	71	229

The above data reveals that only about 24% peoples are connecting their sullage to the drains while 76% peoples are disposing their sullage by improper means which are causing health hazards (for details pl. refer to Appendix-3). The data also reveals that the peoples are not conscious about their hygiene standard.

#### 4.2.1.DICUSSION:

The condition of present drainage system reveals that, more drains are required and those are to be designed to evacuate both rain water & waste water. The built up areas should be provided with road side shallow depth drains to drain out the rain water & waste water from the built up areas.

All the drains are not well inter linked with each other. As a result, water logging is observed in the drains. In some places, the pipe lines cross the drains with larger dia casing pipe, which causes water logging, specially when garbage is there within the drains. Though the drains are towards different outlets, all the drains should be with inter linked with each other.

The built up areas face water logging problems. Road side shallow-depth drains (depth ranges from 2 inch to 4 inch) and those are to be connected with the feeder drains (the existing drains) to evacuate all the rain water from the built up areas.

Manpower for cleaning, operation and maintenance is in acute shortage in Meherpur pourashava. (i) A permanent sanitary inspector is needed to be appointed to meet up the proper supervision of operation & maintenance activities. (ii) More sweepers should be appointed. Each sweeper should be responsible for the cleaning of drains of certain length. The jamader & sanitary inspector will supervise and monitor the activities. (iii) The total length of drains & roads are to be cleaned and number of sweepers should be provided accordingly.

More measures may be taken as, (i) The drains should be cleaned at least once in a month, (ii) The nearby households/ shopkeeper will be held responsible to clean the drain if any solid waste/garbage are thrown into the drains. (iii) The CSC, PCS & WSSC people will supervise/ monitor the drain cleaning activities. (iv) Bi-monthly PCS workshop may be arranged to promote cleaning of drains properly.

#### 4.3. SANITATION SYSTEM

The main objective of the project is to improve the health situation of the poura-people. Through the project's intervention, the health situation has been improved but not upto expectation. All the poura peoples have not been provided with low cost latrines. On the other hand, some of the single pit latrines have been filled up and the second pit has not yet been provided to the beneficiaries. Some low income people are still using the surrounding lands/ bushes for excreta disposal which are causing a serious health hazards.

Sanitation facilities to all is the prime factor to reduce the waterborne diseases, but the existing system does not meet that requirements. An investigation has been made on 300 households (100 in each ward) and the present sanitation status are mentioned in the table 4.3.

Table. 4.3. Existing sanitation status of Meherpur pourashava.

Area	Household visited	Pucca latrine	Low cost latrine	Kutchha latrine	No latrine
Ward -1	100	60	11	11	18
Ward -2	100	31	51	10	08
Ward -3	100	0	61	01	38
Total	300	91	123	22	64

The above table reveals that, about 71% population are using sanitary latrines (pucca & low cost) and about 29% population are using unsafe latrines (kutchha & no latrine). About 21% people are using nearby ditches, bushes, fields etc. to dispose their excreta which is not at all acceptable. The people of ward no. 3 are comparatively of low- income group and 38% people in that area have no latrine facility (for more details pl. refer to Appendix-3).

#### 4.3.1. DISCUSSION:

A feasibility study was done in the pre-project period and it was found that, about 2100 latrines were needed to meet up the total demand. In that report, it was mentioned that one latrine would be used by 8 members on average but the requirement of sanitary latrines are more than that was considered in the pre-project period. Actually one latrine has been provided to one family and one family consist of 2,3,4 upto 6 family members. So, the demand has automatically increased. Single pit latrines are insufficient and those existing single pit are needed to be improved to double pit latrines.

Instead of 8 members per latrine less number of peoples are being provided with one latrine because of a lower family size. On the other hand, an area with additional 300 households has been incorporated within the pourashava, recently. It has been surveyed jointly by the CSC members & the commissioners and it was found that at least 1000 more sets of latrines are required to meet up the present demand.

All the single pit latrines should be promoted to double pit latrine either with a Y-connection or another pit with a blind slab. Proper hygiene education should be provided to use the two pit latrine. A provision can be made from pourashava to construct two pit latrine while approving the building plan.

Most of the superstructures are made with bamboo, gunny bags, old cloths etc. which are unhygienic. An initiative can be taken from pourashava to provide Ferro-cement wall & slab to the latrine owners. A private initiative may be involved to make the superstructures and an incentive may be provided from pourashava to such supplier. If Ferro-cement structure is not possible, proper fencing by bamboo and plastering by earth, like the Kutcha houses be made because the latrines should be treated as a house indeed. An incentive / prize can be awarded by the pourashava i.e. the good superstructure makers may be awarded and this prize giving ceremony may be done once in a year.

#### **4.4. SOLID WASTE MANAGEMENT**

The solid waste management system of Meherpur town is very poor. The usual practices are that the peoples use ponds, ditches, rivers, bushes etc. for their waste disposal in the fringe areas. In the core area, the peoples use to deposit their wastes to a fixed place, dust bins where available, sometimes within the nearby drains and in open places. The solid waste disposal status has been counted at random, and the results have been summarised in table 4.4. There were some tin-

made dustbins in the pre-project period within the poura-area, each of capacity 0.3 cum, most of which are now in damaged condition. From the project, 8 dustbins has been provided, each of capacity 1.25 cum. Have been provided. There are about 30 waste accumulating places where the peoples deposit their wastes. Solid wastes are collected from the dust bins and waste accumulating places by pourashava truck and dump those outside the poura-area in a low lying place. The cleaning system is very irregular. Table 4.4. shows an overview about the waste management status of the town, derived from 300 household survey made in the pourashava.

Table 4.4. Waste management status of Meherpur pourashava.

Area	Household visited	Use Dust Bin	By other means
Ward no. 1	100	12	88
Ward no. 2	100	0	100
Ward no. 3	100	0	100
Total	300	12	288

The above data reveals that only 4% people are disposing their solid wastes into the dust bins but most of the people (96%) are dumping their solid wastes in an improper way which are causing a serious health hazards (for more details pl. refer to Appendix-3).

The present situation of waste disposal system in the total poura-area is unhygienic. Irregular cleaning system creates wastes hazards. Improper depositing of the wastes creates hazards also. Improper dumping system creates another hazards in the low lying areas. Sometimes the drains face water logging & hazard due to dumping of wastes into the drains.

#### 4.4.1. DISCUSSION:

It has been observed that i) In ward no.1, there was no dust bin. Solid wastes were dumped into holes and along road sides or in open places.

ii) In ward no.2, dustbins were located only in the market area. Garbage was dumped in various places and along the road sides, causing hazardous situation.

iii) In ward no. 3, there was no dust bin as the area is not properly urbanised yet.

The above observation clearly indicate that solid waste collection, transportation and disposal in the pourashava need improvement.

It has been estimated that around 30 more dustbins, each of capacity 1.25 cum, and 75 more portable dustbins, each of capacity 0.3 cum, are essential to meet up the total present demand.

It is also essential to construct home made garbage pit to deposit the households wastes. The number of pits should be dug in every houses specially in the fringe areas. Hygiene education may play an important role in this effort.

It is essential to collect wastes regularly. For this purpose, more garbage carrying truck & sufficient manpower should be provided from the pourashava.

Solid waste management may be developed in the poura- area as: (i) During collection of wastes, proper screening of reusable materials should be separated, (ii) Organic waste should be separated and be used for Bio-gas generation. So, installation of bio- gas plant is necessary. (iii) Dumping of inorganic waste to the low lying area nearby pourashava town and which can be used as market/ housing in future.

#### 4.5. WATERBORNE DISEASES

**General:** The project's main objective is to improve the health situation of the poura-people. To improve the health situation, use of safe water, safe waste disposal, safe drainage system, safe sanitation facilities etc. has no alternatives.

**Perception of waterborne diseases by the poura people:** An investigation made on the perception of cases of diarrhoeal diseases by different level of people has been summarised in the table 4.5.

Table 4.5. Perception of causes of diarrhoea by education category.

all figures are in percentage							
Educat. Categ.	No. of respond	water	unhygienic food	water & food	others	don't know	total
Graduat	3	67	33	-	-	-	100
HSC	3	100	-	-	-	-	100
SSC	10	10	70	10	-	10	100
Primary	60	10	68	3	10	9	100
Sign	5	20	60	-	20	-	100
Illiterate	79	-	62	-	33	5	100
Total	160	6	65	2	21	6	100

It reveals from the above table that most of the educated people are stressing on water and unhygienic food are the main causes of the diarrhoeal diseases.

Moreover, a) most of the educated persons said that water was the main cause of diarrhoea. b) the less educated persons opined that unhygienic food was the main cause of the disease.



Table - 4.6. Perception of causes of dysentery by education category

Education.	Respondent	water	unhyg. food	spicy food	irreg. meal	other	don't know	total
Gradu.	3	33	-	33	-	34	-	100
HSC	3	-	33	-	33	-	34	100
SSC	10	10	50	10	20	-	-	100
primary	60	5	27	23	20	15	10	100
Sign	5	20	40	-	40	-	-	100
Illiterat	79	-	18	13	27	5	37	100
Total	100	4	24	16	24	9	23	

The above table reveals that: a) Most of the educated people said that water, unhygienic food & irregular meals were the main causes of dysentery.

b) Most of the illiterate respondents did not know the causes of dysentery. Those who did have an idea attached most importance to unhygienic food and irregular meals.

c) On average, 16% of the people gave importance to spicy food.

Table - 4.7. Perception of causes of worms by education category

Education.	Respondent	water	unhy. food	spicy food	irreg. meal	play in soils	don't know	total
Gradu.	3	-	33	34	-	33	-	100
HSC	3	-	33	33	-	33	-	100
SSC	10	-	-	-	60	40	-	100
Primary	60	3	10	13	58	7	2	100
Sign	5	-	20	-	80	-	-	100
Illiterat	79	-	5	3	57	1	34	100
Total	160	-	8	8	56	7	21	100

It reveals from the above table that:

- a) the more educated people identified open defecation and uncleanness as the major causes of warms.
- b) sweet causes warms, a traditional belief in Bangladesh, scored high (56%) upto the respondents with secondary education.

Table - 4.8. Perception of skin diseases by education category

Educational	Respondent	dirty water	irreg. Bath	lack of clean	impure blood	other	don't know	total
Gradu.	3	-	-	67	-	-	33	100
HSC	3	-	33	67	-	-	-	100
SSC	10	-	10	50	20	10	10	100
Primary	60	3	5	57	10	9	16	100
Sign	5	-	-	60	-	20	20	100
Illiterat	79	3	6	29	19	2	41	100
Total	160	3	6	43	14	6	28	100

In the above table it has been shown that:

- a) the more educated people felt that, lack of cleanliness and irregular bath are the main causes of skin diseases.
- b) illiterate and less educated persons also gave more importance to lack of cleanliness.

28% respondents were not aware of the causes of skin diseases. It can be concluded here that the main four diseases namely, diarrhoea, dysentery, worm & skin disease, as per educated person's decision, are caused by unhygienic conditions and it has been suggested that hygiene education should be provided, specially to the illiterate and less educated groups on: - i) appropriate water use, ii) the link between water use & hygiene education practices and iii) the water related diseases.

#### **RECORD OF WATERBORNE DISEASES IN MEHERPUR TOWN:**

The project work started from July 1994 and the poura-people has started to get benefit from January 1996. The data was collected during this study from Meherpur sadar hospital, Mother & child welfare center and sadar thana health office regarding the waterborne diseases within the poura area. The data collected was both for pre-project & post-project periods.

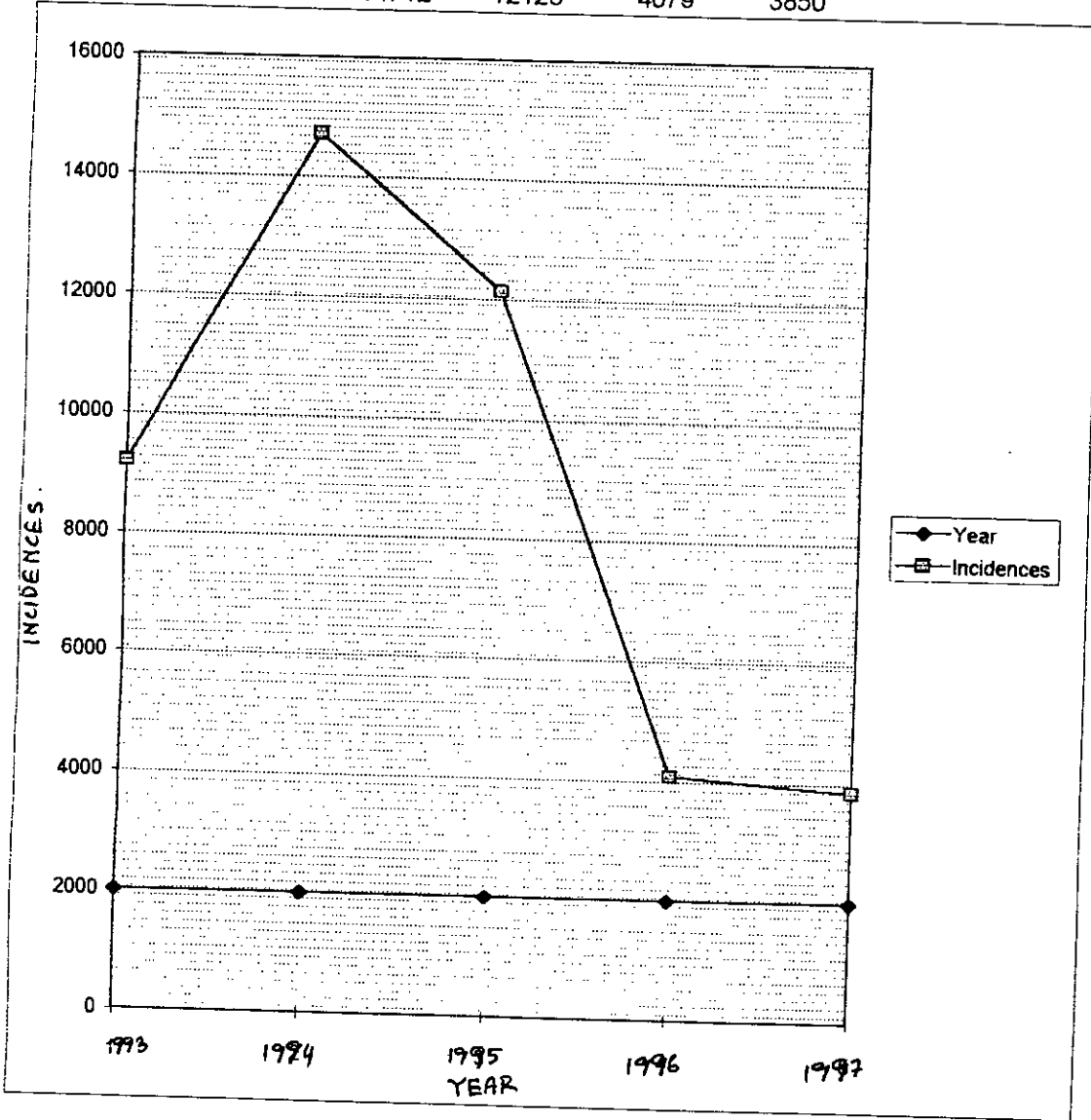
**Meherpur sadar hospital:** The incidences of waterborne diseases for the years 1993, 1994, 1995, 1996 & 1997 (projected) are shown in fig. 4.3.

It may be observed here that the incidences have significantly reduced after the implementation of the project. (for more details pl. refer to Appendix - 4, 5, 6, 7)

**Sadar thana health office:** The incidence of waterborne diseases were recorded from sadar thana health office which were as per record of the pourashava health

Figure 4.3 Year wise waterborne diseases (sadar hospital record)

Year	1993	1994	1995	1996	1997
Incidences	9178	14712	12125	4079	3850



section. As per records, the incidences were 203, 172 and 150 in the years 1995, 1996 and 1997 (projected) respectively, as presented in fig. 4.4.

The above figure indicates that waterborne diseases have been improving and which is due to water supply, sanitation and hygiene education intervention in the poura area. (for more details pl. refer to Appendix-8).

**Mother and child welfare center:** Data was collected from the Mother & child welfare center about the incidences of waterborne diseases under poura area, where 727 patients attended in 1995, 737 patients in 1996 and 460 (projected) attended in 1997 which are presented in Fig. 4.5.

The above figure indicates that a significant improvement of waterborne diseases has been achieved due to water supply, sanitation & hygiene education in the poura area (for more details pl. refer to Annex-9, 10).

#### **4.5.1.DISCUSSION:**

The records of Meherpur sadar hospital reveals that the incidences of waterborne diseases decreased to about 33.64% from 1995 to 1996 and again decreased to about 80% from 1996 to 1997 which seems to be a significant achievement. The

Figure 4.4 Year wise waterborne diseases (Thana health office)

Year	1995	1996	1997
Incidences	203	172	150

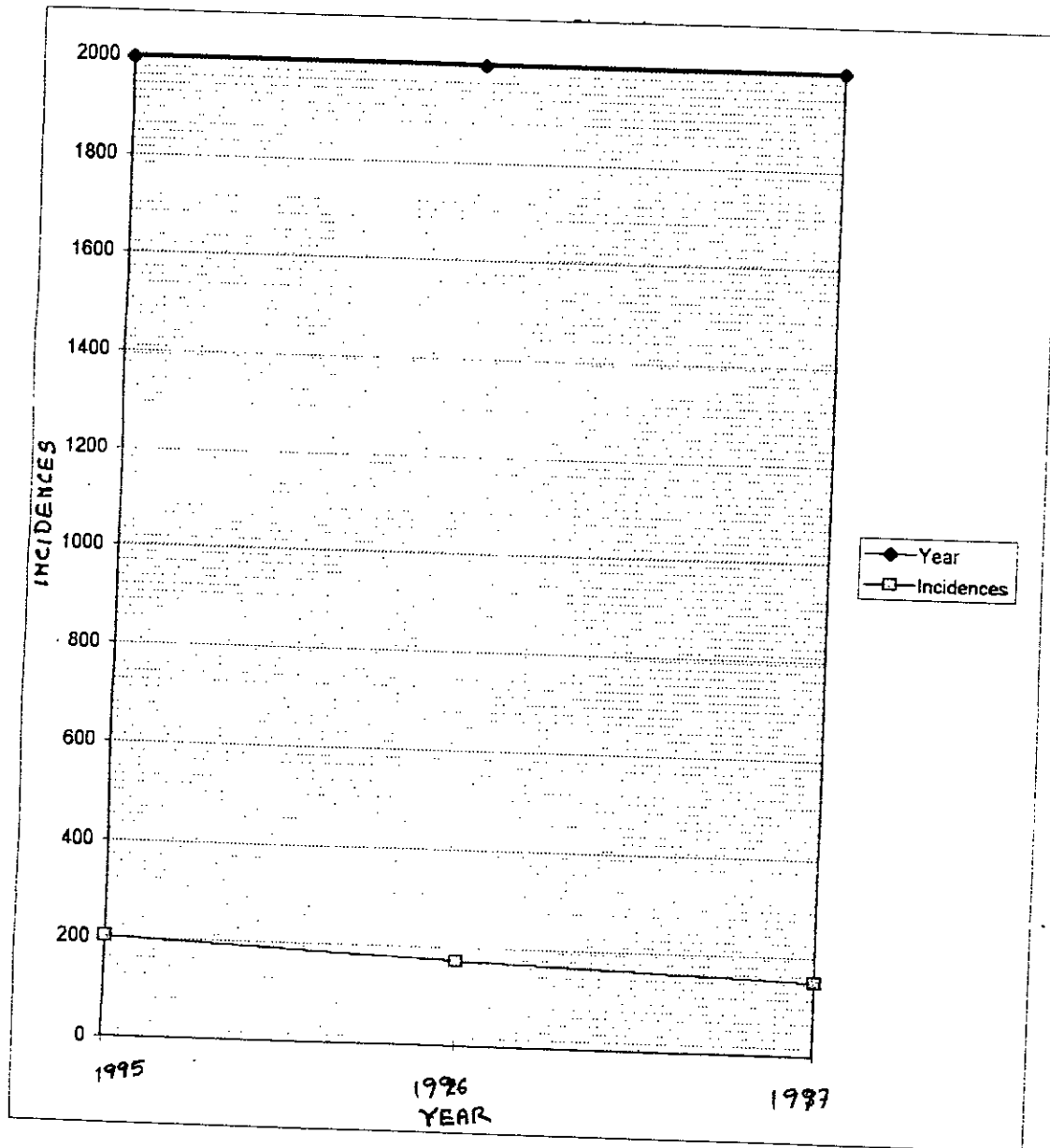
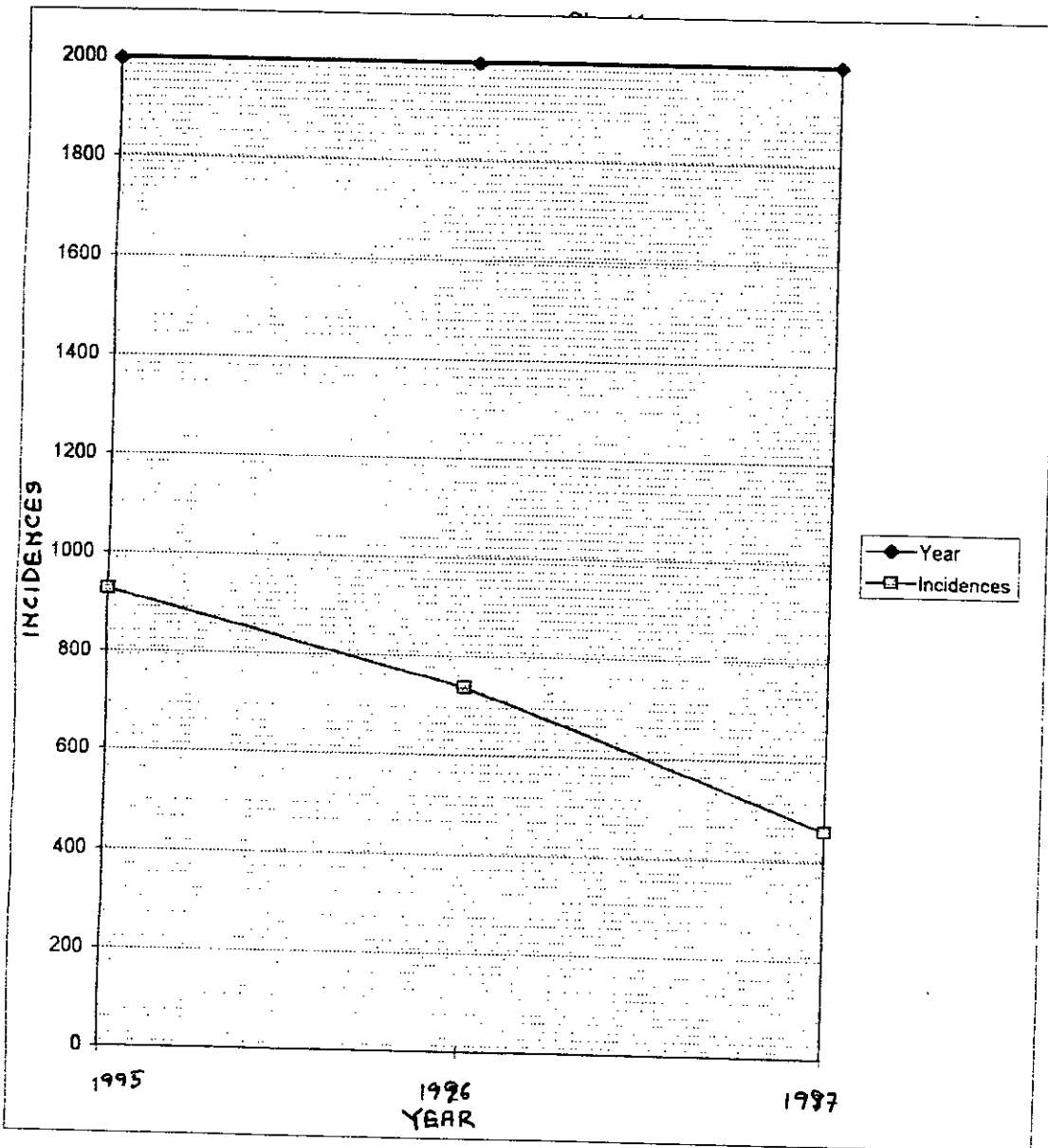


Figure 4.5 Year wise waterborne diseases (Mother & child welfare center)

Year	1995	1996	1997
Incidences	927	737	460



sadar thana health office's record tells the similar story of decreasing mode of incidences of waterborne diseases (decreased to 84.7% from 1995 to 1996 and 87% from 1996 to 1997). The Mother & child welfare center also indicates the same sign i.e. improving mode in the incidences of waterborne diseases (decreased to about 79.5% from 1995 to 1996 and about 62.4% from 1996 to 1997). It is very clear that the reduction in the incidences of waterborne diseases has been achieved through the project's intervention with water supply, sanitation and hygiene education. To eliminate/ reduce the waterborne diseases, more emphasis should be given on the issues like, (i) treated piped water to all, (ii) proper drainage facility throughout the pourashava, (iii) proper sanitation facilities to all, specially to the low income group, (iv) safe waste disposal system for the total poura area, (v) hygiene education to all the poura people.

#### **4.6. HYGIENE EDUCATION**

Hygiene education has been provided to the poura people specially to the low-cost latrine beneficiaries. The health educators & promoters are engaged in the hygiene education activities. Due to the shortage of manpower in the CSC, the hygiene education is not being provided to the total poura-people. The community sanitation center is providing personal hygiene education, hygiene education to the school children, hygiene education to the latrine beneficiaries/the poorer mass etc. In future it has been decided to provide hygiene education to all the people within the pourashava.

Institutional arrangement: An organizational base which takes the sanitation program "to the community" has been proposed with the establishment of community sanitation center - CSC. An extension of the CSC is the ward based community water supply and sanitation committee- WSSC. The concept has already been established and the activities of both CSC & WSSC are expected to be increased with an improved MIS under pourashava.



Motivation of women on Hygiene Education: Improvement of sanitation by increasing the sanitation facilities is most important in Meherpur, specially for the poorer part of the population. The result in terms of hygiene practice is not upto the desired level. So, motivation of women in hygiene practices can play an important role in the society.

Cleaning and emptying the latrines: Hygiene practices are poor in Meherpur. Most of the latrines are even never cleaned. However the slab pit latrines, sanitary pit latrines and septic tanks are cleaned in almost all cases and at about two third of the households once in a week or more often. The cleaning is mostly done by the women (93%). Quite some latrines and septic tanks have not been emptied in the past (41%). If a latrine or septic tank is emptied, it is almost always done by a private cleaner. So, (i) Hygiene education should be provided properly, especially in the field of latrine cleaning. (ii) WSSC members should be involved more for cleaning the latrines and an initiative can be taken from the pourashava. (iii) Local leaders should be selected by the WSSC & CSC members who can monitor the cleaning activities. (iv) Regular campaign will be highly helpful for cleaning activities.

Sanitation Education: A specific program for sanitation education (latrine use & care) has been running through the CSC & WSSC peoples and they are trying to change the attitude of the target households and is primarily concerned with changing their sanitation habits. The sanitation education may be as: (i) how to use sanitary latrine, how to flush/clean the latrines after use, (ii) how to wash their hands after use, (iii) how to clean the latrines daily, (ii) to train young children and school children as to how to use the latrine and (v) to collect and dispose of their excreta until the children are trained.

#### **4.6.1.DISCUSSION:**

The present trend of works by the CSC members are to provide hygiene education is centred into the latrine & hand tube well beneficiaries. But emphasis should be given to all kinds of people so as to develop total hygiene practices by all. The WSSC members can monitor the activities run by the CSC members as well as the practices done by the poura people.

## CHAPTER-5

### CONCLUSION AND RECOMMENDATION

#### 5.1 CONCLUSION:

The project's main objective is to improve the health situation of the poura people. Some infrastructures have been implemented and some infrastructures have been planned to be implemented in the field of water supply, sanitation, solid waste management along with hygiene education to achieve this objective. In this study, a mid term evaluation on health improvement has been made and it was found that within these three years of project period (1994 to 1997) a significant achievement has been gained in respect of reduction in the incidences of waterborne diseases. The reduction of waterborne diseases may be possible through maintaining personal hygiene, sanitation barrier and by using safe water. The different hospital records reveal the improving situation of waterborne diseases. The investigation was done in three ways. First one is the condition of water supply, sanitation, solid waste management facilities provided & being provided in the poura area. The second one is the water supply, sanitation status prevailing in the poura area and the third one is the result i.e. the condition of waterborne diseases of the poura people. The following conclusion may be drawn on the population coverage by facilities in the field of water supply, sanitation and hygiene education and the resulting improvement in health situation:

- In Meherpur pourashava, only 15.4% peoples are availing piped water facilities, 68% peoples are availing HTW water and till now about 31% people have no water supply facilities.
- Only 24% people have sullage connection while 76% people have no sullage connection.
- Sanitation status is also poor i.e. 9% people are using kutchha (unsafe) latrine and 21% people have no latrine.

- Waste disposal system are also very poor i.e. about 4% people are with safe waste disposal system while 96% population are with unsafe waste disposal practices.
- Hygiene education has been provided to the poura people, specially the low cost latrine and tube wells beneficiaries.
- The limited facilities provided by the project has promoted the health situation of the poura people. The decreasing pattern of waterborne diseases is a good indicator of health improvement which have been achieved by the facilities provided in the field of water supply, sanitation & hygiene education. It has been further confirmed that the improvement of water supply system, sanitation, solid waste management along with hygiene education can improve the health situation of the poura people.

## **5.2 RECOMMENDATION:**

To improve the health situation of the poura people, it is obvious that there is no alternative of improving the water supply system, sanitation status, solid waste disposal system and hygiene practices. So, the following recommendations are made to improve the health condition of the poura people further.

### **5.2.1. Recommendation for improvement:**

Water supply system: The project has been started in July 1994. Within these period i.e. upto June 1997, only 15.4% population has been provided with piped water. Piped water supply to the rest 84.6% population is a requirement to improve the health situation. Arsenic problem is acute in the area, so, treatment of water for the removal of arsenic is essential. It may be mentioned here that the project's grand will continue upto June 1999. So, within these two years period, arsenic/ iron free water should be supplied to all poura people. More specifically, to improve the health condition as well as to minimize the waterborne diseases in the poura area, the following considerations may be taken into consideration:

- (a) For the total coverage, only two existing production tube wells are not sufficient. At least four more production tube wells are needed. The present

17.5 Km pipelines are not sufficient to cover the total poura area. Additional 15 Km pipe lines are needed to cover the total poura area.

(b) The work of ARP & OHT are being delayed due to the bureaucratic procedure & payment system. The tendering & work order procedure have been lingering the work. After issuing the work order, another one year will be needed to complete the work. So, small arsenic removal plant or arsenic removal procedure can be adapted at least upto the period of completion of the plant. The peoples are eagerly waiting to have the arsenic free water but they are not getting that. So, urgent construction of arsenic removal plant as well as provision small plants, to meet up the emergency demand, is required. The overhead tank will no doubt ensure 24 hours water supply and to ensure continuous supply, at least two overhead tanks are needed.

(c) Before starting the project, the water supply was for 6 hours on average. Now as a result of project's intervention, the supply has been increased to 12 hours supply. The following Recommendation can be made to further improve the situation:

(i) To increase supply for 24 hours, more production tube wells are required, though there are provision for 3 more production tube wells, the work has not yet started.

(ii) A reliable water supply system of good quality is a must and for that a regular washing and rehabilitation systems should be adapted by the PWSS and the target should be reached within June 1999.

(d) There is no regular washing & disinfecting of the pipe lines of the existing system. Due to heavy iron content (around 3 to 5 mg/l), the water becomes yellow in colour. So, the following measure are essential: (i) Before installation of ARP, the pipe lines should be cleaned by foam pig at least once in a month. (ii) Before installation of ARP, the piped water should be disinfected by adding bleaching powder. (iii) After installation of ARP, the pipe lines should be washed at least bi-monthly. (iv) There is no chlorination system, a system should be adapted for chlorination of water.

(e) The existing pipe line & house connection system is not free from leakage, which causes wastage and pressure problem. Regular wash is not

done and that is done only after having complaints from the consumers. To improve the existing condition, the following recommendation can be made:

(i) Leak detection system should be improved. A regular MIS should be formed to detect & repair the leakage. For that, the CSC group, the PWSS people & the PCS people should be involved more in this activities.

(ii) Pipe line wash by foam pig is very much essential in Meherpur Pourashava and for that, a sufficient number of sluice valves, washouts are required to be installed soon in the pipe line system.

(iii) For piped water, it is also essential to evacuate the waste water and for this purpose proper sullage connection should be done to evacuate total waste water from the poura area. The WSSC, PWSS & CSC workers can be engaged to perform the job of sullage connection in every house and monitor the activity properly.

(iv) The unauthorised connections should be removed from the system and wastage of water should be controlled to make the system profitable/sustainable.

(f) Now there are 383 nos. of hand tube wells within the pourashava. An attempt has already been taken into consideration in such a way that, all the hand tube wells will be replaced by piped water. For that, the following Recommendation can be made:

(i) In lieu of 383 hand tube well, at least 300 group tap will be provided and each group tap will be provided for 3-4 families and they will pay for each group tap.

(ii) (ii) All other area like market places will be served with piped water and some street hydrants should be provided.

#### **Sanitation:**

The sanitary conditions are deplorable. Lack of maintenance is noticed everywhere. The rest households who have not received latrines under the project should be provided with a latrine on subsidy. There should be a system of supplying sanitary latrines and for which the installation basis

payment system should be adapted. An MIS should be developed by the pourashava to clean each and every latrines by the people concerned. A remuneration system as well as a punishment system may be imposed by the pourashava on cleaning of sanitary latrines.

#### **Drainage:**

It has been noticed that some of the poura-people use to throw their wastes/solid wastes to the nearby drains as a garbage pit. People must be made achieve of proper hygienic practice and if needed penalty may be imposed for the households adopting such unfair practices. Paurashava must keep the drains clean to avoid unhygienic conditions in the Paurashava.

#### **Solid Waste:**

Regarding solid waste disposal, necessary steps should be taken by the Paurashava to provide dustbins, collect garbage and dispose it off in a hygienic process preferably by sanitary landfills. Recycling of solid waste should be encouraged.

#### **Health Education:**

From the different types of survey, it appears that most of the people are ignorant about basic hygienic practice. They are not much concern about an unhygienic environment and itis evil impact on their health and seem used to it. Therefore quite revolutionary action is required to motivate the people to maintain basic hygienic condition.

#### **NGO involvement:**

The government provides all the basic amenities to only a small part of the population. Hence, the community itself should come forward to supplement the efforts of the government. So they must become aware of the facilities they need and to make a real effort to develop the integrated program of water supply, sanitation and drainage. NGO can play an important role by providing both hardware and software. Since NGO have the necessary infrastructures and a trained workforce, they can start working immediately, until an alternative arrangement with local initiative comes up. A national NGO may take up training, health education, health assistance, sanitary

inspectors, teachers, Imams, women organizations and other potential agents of development on water use and hygiene practices.

**Women participation:** Women constitute almost half of the population and as such they must be made equal partners in development. Women's role particularly in water supply and hygiene practice should be far greater than that of the males, in most cases they spend all their time on household activities. As such they should be given priority as agents for change. A slight improvement in their consciousness on health and hygiene matters can do a lot to change the social environment. As they rear their babies they can also rear the hygiene standards in the society and these activities may be promoted by more motivational works like group meeting, training etc. They should therefore be given every chance to come forward and to devote their best efforts to make the integrated program of water supply, sanitation, drainage and hygiene practice a success.

#### **Maintenance:**

It has been observed that sometimes the piped water supply systems is not working properly, the latrines are not properly maintained, the drains are clogged and the solid wastes are scattered all around. The conclusion is that having proper facilities is a good thing but the most difficult part is to use it properly and efficiently. This calls for a strong emphasis on maintenance rather than development. For this, the people should be made conscious through social and communal approach. All people can play better role in this respect. Women who mostly pass their time inside the house compound should be aimed at and is the first place for proper maintenance of these service systems.

Efforts should also be undertaken to improve the water revenue collection system in order to arrive at financial sustainability of water supply system.

#### **Implementing System of the Project Components:**

The total project works have been divided into A, B, C, category works. Construction of ARP, OHT, Pipelines, Drains, Latrine supply etc. has been designated as A category works for which DPHE is responsible. The B category works are Community latrines, Dustbins, Low cost latrines, school latrines etc. and for which the pource Engineering section is responsible. The

C category works are normal operation & maintenance, reticulation lines, the sluice valve chambers, etc. which are to be performed by the Pourashava Water Supply Section. All the money come from the project through DPHE project's division. No problem arise for the A category works but the financial problems arises for B & C category works. The expenditure and reimbursing procedure make the system delay specially for B & C category works. On the other hand, the normal load of pourashava's own work is quite high, as a results proper attention is not given to 18 DTP's B category works. At the same time the lingering procedure to spend money & reimbursement system of C category works make the system unsuitable. So, the Recommendation can be made on implementation procedure are as follows: (i) All the A & B category works like ARP, OHT, pipelines, HTW, street hydrants, dust bin etc. may be done by the DPHE, as they are only engaged for 18 DTP works. The sub-divisional SDE, SAE, WA are responsible for the 18 DTP works and they have no other works like pourashava. (ii) The maintenance works like, regular washing, house connection rehabilitation, leak repair, pipe line cleaning, sluice valve chamber rehabilitation, etc. may be done by the PWSS and the fund should be directly from the project's imprest account and they may be directly responsible to the project office for C category works.

### **5.2.2 RECOMMENDATION FOR FUTURE STUDY:**

In order to improve the health situation of the poura-people, the measures have been discussed on the components like, water supply, drainage, sanitation, hygiene education etc. The detail study for the above mentioned components are essential because , every development work has environmental consequences.

**Water supply:** Study should be made on the of water supplied to the poura-areas. The management of water quality is a huge task which is absolutely essential to get the health benefit of water supply. The sullage from the arsenic treatment plant may cause hazards in future. So, the details study on that sullage treatment & disposal system should be taken into consideration.

**Sanitation:** The huge amount of double pit latrines may deteriorate the soil condition, ground water, vegetation/plant growth etc. which should be taken into consideration for detailed study.



**Drains:**

The disposal drainage water from the paura area may affect the surrounding water environment and a detailed study is essential especially for the disposal system.

**Solid Waste Management:** A detail study is essential to find out the adverse effect for huge number of home made garbage pit, dumping of solid wastes may create problem in the surface water and that may be taken into consideration.

Finally the health benefit of the interventions made in Meherpur Paurashava in the form of water supply, sanitation and hygiene education should be studied in depth after the full implementation of the project.

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# APPENDIX-A

Appendix-1 Use of water sources for different purposes

Purpose	HC,SH	TW	Pond	Riv'rKhal	Others	Total
Drink	4	95	0	0	1	100
Cooking	5	89	0	0	6	100
Bath	9	59	6	18	8	100
Wash	9	58	5	19	9	100

Appendix-2 The drainage system before the project

Total length	Khal (Km)	Pucca (Km)	Kutcha (Km)	% in good cond
2.8	0.0	2.41	0.40	16.27

APPENDIX-3

DATA SHOWING WATER SUPPLY, SANITATION, DRAINAGE & SOLID WASTE DISPOSAL STATUS OF MEHERPUR POURASHAVA.

STATUS OF WORD NO. 1,2,3.

name	husband/father	village	family members	latrine type	latrine source	house connection	hand tubewell	HTW owner	sullage connection	water logging	waste disposal
1. Kulfun nessa	Md.A. kalam	school para	8	pacc a	self	yes	yes	self	yes	no	pit
2. Khaleda	Saidur R'man	do	5	do	do	yes	yes	do	no	no	do
3. Shahar banu	Fazlul Haque	do	5	do	do	yes	yes	do	no	no	do
4. Farida	Ash'ful Haque	do	5	do	do	yes	yes	do	yes	yes	DBin
5. Ramida	Azizul haque	do	3	do	do	yes	yes	do	yes	no	pit
6. Renu chy	A.Awal	do	3	do	do	yes	yes	do	yes	no	db
7. Reena	Mostofa	do	4	do	do	yes	yes	do	yes	no	pit
8. Dali	Nuruzzaman	do	3	do	do	yes	yes	do	yes	no	db
9. Alima Khatun	Dr. AyubHos n	do	2	do	do	no	yes	do	yes	no	pit
10. Nasreen	Alul haque	do	3	do	do	no	yes	do	yes	yes	do
11. Mabia	Afsar	do	10	do	do	no	yes	do	no	yes	do
12. Rebunnahar	Abul Bshar	do	5	do	do	no	yes	pour asha va	no	yes	do
13. Amena	A. Aleem	do	13	do	do	no	yes	do	no	yes	do
14. Raushan Ara	Azizul	do	6	L cost	DPH E	no	yes	do	no	yes	do

15.Kiron	Rustam Ali	do	6	kutch a	--	no	yes	do	no	yes	do
16.Shahana	Moslem	do	10	no	-	no	yes	self	no	yes	do
17.Anowara	Hosen Ali	do	5	pacc a	self	no	yes	self	no	do	do
18.Shamsunn ahar	Ramjan	do	5	do	do	no	yes	self	no	do	do
19.Angana	Shankar	do	11	do	do	no	yes	self	no	do	do
20.Jahanara	Osman	do	6	low cost	DPH E	no	no	-	no	do	do
21.Jamila	Haider Ali	do	7	no	-	no	no	-	no	do	do
22.Niharan	Jalil	do	13	lowc ost	DPH E	no	no	-	no	do	do
23.Parbati	Joideb	do	5	pacc a	self	no	yes	p.sh ava	no	do	do
24.Shnkari	Shib Chandra	do	12	lowc ost	DPH E	no	yes	self	no	do	do
25.Rezia	Isha Kha	do	10	pacc a	self	no	yes	self	no	do	do
26.Panoara	Pear Kha	do	9	do	do	no	yes	p.sh ava	no	do	do
27.Monoara	Oli Ahmed	do	9	do	do	no	yes	self	no	do	do
28.Farida	Iman Ali	do	5	no	-	no	no	-	no	no	do
29.Mayarani	-	do	8	pacc a	self	no	no	-	no	yes	do
30.Hasina	Asgar	Malopara	6	do	do	no	no	-	yes	do	do
31.Faijanness a	A.Gafur	Halpara	13	do	do	yes	yes	self	no	no	do
32.Hajera	Khademul	do	5	no	-	no	do	do	no	no	do

33.Rokeya	Sekendar	do	6	pacc a	self	no	do	do	no	no	do
34.Sheela	Angur	do	6	do	do	no	no	-	no	no	do
35.Akramun	Rajjak	Bosh	10	do	do	no	yes	self	no	yes	do
36.Hosneara	Imdadul hq.	do	10	do	do	no	do	do	no	yes	do
37.Arfatun	Achir ali	do	9	do	do	no	do	do	no	yes	do
38.LOpash	Shafiqul	do	6	do	do	no	do	do	no	yes	do
39.Fatema	Sirajul	Shajipara	4	do	do	no	do	do	no	yes	do
40.Lili	Bari biswas	do	8	do	do	no	do	do	no	yes	do
41.Lajaton	Omar Ali	do	7	no	-	no	no	-	no	yes	do
42.Popi	Mahfuj	do	3	pacc a	self	no	yes	self	no	yes	do
43.Kulsum	Abul	do	9	do	do	no	do	do	no	yes	do
44.Shamiran	Kader	do	10	lowc ost	DPH E	no	do	do	no	yes	do
45.Lutfun	Jakir	do	7	no	-	no	do	do	no	yes	do
46.Mahima	Anarul	do	4	pacc a	self	no	no	-	no	yes	do
47.Mani	Amirul	do	6	do	do	no	no	-	yes	yes	do
48.Jamila	Amanul	do	10	lowc ost	DPH E	no	yes	p.sh avs	no	yes	do
49.Lutfunness a	Ahmmad	do	11	no	-	no	no	-	no	yes	do
50.Sonavanu	Amir ali	do	15	pacc a	self	no	yes	self	no	yes	do
51.Aziza	Khairul	do	4	lowc ost	DPH E	no	yes	psha vs	no	yes	do
52.Khairun	Muhiruddi	do	5	kach	-	no	yes	self	no	yes	do

				a								
53. Farida	Khalilur	do	4	lowc ost	DPH E	no	no	-	no	yes	do	
54. Rezia	Harun	do	2	no	-	no	yes	self	no	yes	do	
55. Rehena	Rafiq	do	9	no	-	no	do	do	no	yes	do	
56. Minoti	Shudhichand r	Mukharjee	5	no	-	no	do	do	no	yes	do	
57. Momena	Oadud	do	4	pacc a	self	no	do	do	no	yes	do	
58. Rabeya	Faez	do	11	do	do	no	do	do	no	yes	do	
59. Manira	Chandan	do	3	do	do	no	do	do	yes	yes	do	
60. Sano	Kona	do	11	l.cost	dphe	no	no	-	yes	yes	do	
61. Benjil	A. Rahman	do	7	paca c	self	yes	yes	self	yes	no	do	
62. Ferdos ara	Kabir uddin	do	4	do	do	yes	yes	do	yes	no	DB	
63. Mohasena	G. Solaiman	do	9	do	do	no	yes	do	yes	no	DB	
64. Josna Rashid	H. Rashid	do	9	do	do	no	yes	do	no	no	pit	
65. Golshan	Kazimaddin	do	4	do	do	no	yes	do	no	no	do	
66. Mara khatun	Dr. A. Mannan	do	4	do	do	yes	yes	do	yes	no	do	
67. Nurjahan	Shamsuddi	do	5	no	-	no	yes	do	yes	no	do	
68. Achimina	Eamin	do	5	no	-	no	yes	do	yes	no	do	
69. Khodeja begam	Aftab uddin	do	3	pacc a	self	yes	yes	do	yes	no	do	
70. Kohinur begam	Bablu	do	3	do	do	no	no	-	no	no	DBin	
71. Farida begam	Shamsul Huda	do	5	no	-	no	yes	self	yes	yes	pit	



72.Reena	Dr.Abul kasem	schoolpara	5	pacc a	self	no	no	-	pit	no	Gpit
73.Binu	Nasir	do	6	do	do	no	yes	self	no	no	Dbin
74.Shamsun nahar	Amanulla	do	4	do	do	no	yes	do	no	no	pit
75.Najma	Dr.Feroz	do	4	do	do	no	yes	do	yes	no	Dbin
76.Monoara	Amir Ali	do	7	pacc a	self	yes	yes	self	no	no	DBin
77.Nazmun nahar	M.Haidar	do	5	kach a	-	no	no	do	no	no	DBin
78.Jahanara	Anis	do	5	do	-	no	no	do	no	no	pit
79.Momena	Altaf	do	6	l.cost	dphe	no	yes	do	no	yes	do
80.Gelema	Aowlad	do	11	kach a	-	no	no	do	no	no	do
81.Mahbuba	Iskendar	Halpara	6	pacc a	self	yes	yes	do	no	no	do
82.Nelima	Pantosh	do	5	do	do	yes	yes	do	no	no	do
83.Shajeda	Jahangir	do	5	do	do	no	yes	do	no	no	do
84.Jali	Jamal	do	4	do	do	no	no	do	no	no	do
85.Shameem	Mutaleb	do	5	do	do	no	no	do	no	no	do
86.Sharifun	-	do	1	do	do	no	no	do	no	no	do
87.Jahanara	A.Rashid	do	6	no	-	yes	ye	P.sh a	no	no	do
88.Manoara	Shamsul alam	do	4	pacc a	self	yes	yes	self	yes	yes	do
89.Hazera	Gias	do	4	do	do	yes	yes	do	yes	no	DBin
90.Mariom	Moajjem	do	4	do	do	no	yes	do	no	no	DBin

91.Jharna	De;owarHosain	Haldarpar a	6	kach a	self	no	yes	self	no	yes	Gpit
92.Mamtaj Begam	A.Sattar	do	7	do	do	no	yes	do	no	yes	Gpit
93.Rabea	Moslem	do	7	no	-	no	yes	do	no	yes	Gpit
94.Hafija	Nurul Islam	do	4	kach a	self	no	no	do	no	yes	Gpit
95.Bijlee	Elu	do	5	do	do	no	yes	do	no	yes	pit
96.ShamimAra	SadekurRah man	Mukharjee	3	no	-	no	yes	do	no	yes	do
97.Rokeya	Bakul	do	8	kach a	self	yes	yes	do	yes	yes	do
98.Nasera	Mahim Biswas	do	7	do	do	no	yes	do	no	yes	do
99.Rehena parvin	Faker Ali	do	8	no	-	no	yes	do	no	yes	do
100.Momena	Hannan	do	5	l.cost	dphe	no	yes	do	no	yes	do

STATUS OF WORD NO. 4,5,6.

name	husband/father	village	family members	latrine type	latrine source	house connection	hand tubewell	HTW owner	sullage connection	water logging	waste disposal
1.Amena Khatun	Shirajullslam	Shajeepara	9	pacc a	self	yes	yes	self	yes	no	pit
2.Ferdowsi Beg.	Sanautlah	do	3	do	do	yes	no	-	yes	no	do
3.Chitara begam	FajilatUllah	do	5	do	do	yes	yes	self	yes	no	do
4. Osina khatun	HishabUddin	do	6	lcost	dphe	no	yes	p.sh ava	yes	no	do
5.Arifun	BarkatAli	do	3	do	do	no	yes	do	yes	no	do
6.Parul	Tofajjal	do	5	do	do	no	yes	do	yes	no	do
7.Afroza	BabluBiswas	do	4	pacc a	self	no	yes	do	yes	no	do
8.Anowara Khtn	dabir uddin	do	7	lcost	dphe	no	yes	do	yes	yes	do
9.Ifaton	HarunSha	do	6	do	do	no	yes	do	no	yes	do
10.Selina aktr	Elias Mahmd	do	4	pacc a	self	no	yes	do	no	yes	do
11.Ulfatun	Ayub Ali	do	20	lcost	dphe	yes	yes	do	no	yes	do
12.ShefaliDora	Faruk Hosain	do	3	pacc a	self	no	yes	do	no	yes	do
13.FerdousiBeg	Habibur Rah	do	7	do	do	no	yes	do	no	yes	do
14.ShahanaDara	Khalilur Rah	do	4	do	do	no	yes	dp	no	yes	do
15.Malarani	Indrajit Kr.	do	3	do	do	no	yes	do	yes	yes	do

kar.												
16.Hosneara	Enaet Hosain	do	5	do	do	yes	yes	do	no	yes	do	
17.JabedaKhatn	Abul Kalam	o	2	kacha	-	no	yes	do	no	yes	do	
18.AfrojaKanm	KamalUddin	do	5	paca	self	no	yes	do	no	yes	do	
19.JebunNahr	JamalUddn	do	5	do	do	yes	yes	do	no	yes	do	
20.Hosneara	AbulHosain	dc	12	do	do	yes	yes	do	no	yes	do	
21.AyeshaSidka	Shamsullsm	do	9	do	do	yes	yes	do	no	yes	do	
22.SahinraBgm	HabibrRahm n	Thanapara	9	do	do	yes	yes	do	no	yes	do	
23.MajedaBegum	A.Majid Haldr	do	9	kacha	-	no	yes	do	no	yes	do	
24.MonoaraBegum	JulfikarMia	Mukharjee par	8	lcost	dphe	no	yes	do	no	yes	do	
25.ShahidaBeg	SadikuAlam	do	5	kacha	-	no	no	-	no	no	do	
26.Nilufa	GolamMasud	Thanapara	3	kacha	-	no	no	-	no	no	do	
27.Kuria	MostofaJamal	do	4	pacc a	self	no	no	-	no	no	do	
28.Shahida	Fazlul Hq	do	6	lcost	dphe	no	yes	self	no	yes	do	
29.Merina	Abul Hosain	do	5	no	-	no	yes	do	no	yes	do	
30.Marjina	A. Rab	do	4	no	-	no	yes	do	no	yes	do	
31.Nasima	SharifAhmed	do	4	pacc a	self	no	no	-	no	no	do	
32.MajedaKhatn	Superuddin	Fulbaganpara	7	do	do	no	yes	self	no	yes	do	
33.Monoara	A.Gani	do	5	lcost	dphe	no	yes	do	no	yes	do	

Begum											
34. SharVanu	Abdul Gafur	do	5	pacc a	self	no	yes	do	no	yes	do
35. JahedaBegum	Nifaj Uddin	do	10	lcost	dphe	no	yes	do	no	yes	do
36. JahedaKhatun	Omber Ali	do	7	do	do	no	yes	do	no	yes	do
37. JarinaKhatun	Abu Taleb	do	5	pacc a	self	no	yes	do	no	yes	do
38. Monoara	Abu Ali	do	5	lcost	dphe	no	no	-	no	no	do
39. RabeaJam an	Anoaruzama n	do	2	pacc a	self	no	yes	self	no	yes	do
40. Roushanar a	ShaokatHos n	Shajeepar	14	kach a	-	no	yrs	do	yes	no	do
41. MarjinaKhatun	AbdulBari	do	8	pacc a	self	no	yes	do	yes	no	do
42. HasinaBeg m	ImajUddin	do	10	kach a	-	no	yes	do	yes	no	do
43. HaoaBegm	RuhulAmin	do	5	pacc a	self	no	yes	do	yes	no	do
44. HasinaBeg m	SorapAli	do	5	kach a	-	no	yes	do	no	yes	do
45. MinaParvn	KuddusAli	do	4	lcost	dphe	no	yes	do	no	yes	do
46. AsuraBegm	FajlulHq	do	6	do	do	no	yes	do	no	yes	do
47. Jaigunnesa	Jalal Uddin	KathuliRd	3	pacc a	self	no	yes	do	yes	yes	do
48. ShahidaBg m	A. Majid	FulBaganp ara	9	kach a	-	no	no	-	no	no	do
49. RebekaKha tn	RustamAli	do	4	lcost	dphe	no	yes	self	no	yes	do
50. Alea	Khokon	do	4	kach	-	no	yes	do	no	yes	do

				a								
51. Shahana	Shafiqul	do	3	lcost	dphe	no	no	-	no	no	do	
52. Khodeje	Sultan	do	5	kach a	self	no	no	-	no	no	do	
53. Jahanara	Shahidul	do	5	lcost	dphe	no	yes	p.sh a	no	yes	do	
54. Raejan	Elahi Bux	do	2	do	do	no	yes	self	no	yes	do	
55. Arejan Begm	SurmanShek	do	4	pacc a	self	no	yes	do	no	yes	do	
56. Beauty	Nur Islam	do	3	do	do	no	yes	do	no	yes	do	
57. Rokeya	Ramjan	do	5	do	do	no	yes	do	no	yes	do	
58. Rokeya	A. Sattar	do	7	do	do	no	yes	do	no	yes	do	
59. Nurnahar	A. Majid	do	5	lcost	dphe	no	yes	do	no	no	do	
60. Khurshida	MinarHosain	do	3	do	do	no	no	-	no	no	do	
61. Latufa	Dil Mohmed	do	15	do	do	no	yes	psha v	no	yes	do	
62. Rana Begm	SattarAli	do	5	do	do	no	yes	self	no	yes	do	
63. Nurjahan	Sanajaddin	do	3	do	do	no	no	-	no	no	do	
64. Rehena	Inaj Ali	do	4	do	do	no	no	-	no	no	drain	
65. Shahida	MinajAli	do	6	do	do	no	no	-	no	no	pit	
66. JohraKhatn	Coen Shek	do	4	no	-	no	no	-	no	yes	do	
67. Khodeja	Jamal Sk	do	7	lcost	dphe	no	yes	psha v	no	yes	do	
68. Sufia	ChamirShek	do	7	do	do	no	yes	do	no	yes	do	
69. RebekaKhatn	JeaurRahman	do	5	do	do	no	yes	do	no	yes	do	
70. WahedaBg m	SirajUddin	do	6	do	do	no	yes	self	no	yes	do	

71. Shahida Bg m	Jahangir Alam	do	6	do	do	no	yes	do	no	yes	do
72. Jakiron	Jullu Mistri	do	6	do	do	no	ye	do	no	yes	do
73. Safura Bg m	Shamser Ali	do	7	do	do	no	yes	pshav	no	yes	do
74. Jabeda Bg m	Sattar Ali	do	6	do	do	no	yes	do	no	yes	do
75. Hadesa Bg m	A. Jalil	do	12	do	do	no	yes	do	no	yes	do
76. Sharifa	A. Mannan	do	5	do	do	no	yes	self	no	yes	do
77. Maina	Deena	do	7	do	do	no	yes	do	no	yes	do
78. Alima	A. Gani	do	6	do	do	no	yes	do	no	yes	do
79. Ferdousi Bg m	Mostofa	do	3	do	do	no	yes	do	no	yes	do
80. Momna Bg m	Ajim Uddin	do	8	do	do	no	yes	do	no	no	do
81. Jabeda Bg m	Osman	do	4	do	do	no	yes	do	no	no	do
82. Sufia Khtn	Mahasin	do	6	do	do	no	yes	do	no	no	-
83. Buri Khatn	Saifullslam	do	4	do	do	no	yes	do	no	no	-
84. Sadeka Kht n	Babar Ali	do	6	do	do	no	yes	do	no	yes	pit
85. Sharifa Khtn	Mahat Ullah	do	7	do	do	no	no	-	no	no	do
86. Shahida Bg m	Abul Hosain	do	9	do	do	no	no	-	no	no	do
87. Majeda Bg m	A. Sattar	do	5	do	do	no	yes	self	no	no	do
88. Gulnaha r	A. Kader	do	2	do	do	no	no	-	no	no	do
89. Arbison	Ear Ali	do	7	do	do	no	no	-	no	no	do

90.Rojina	JahatAli	do	4	no	-	o	no	-	no	yes	do
91.RahimaBgm	JahanAli	di	6	no	-	no	no	-	no	yes	do
92.Shamsunnahar	Ishaq Ali	do	3	lcost	dphe	no	yes	self	no	yes	do
93.TahminaBgm	A.Kuddus	do	3	pacc a	self	no	yes	psha v	no	yes	do
94.HajeraBgm	A. Sattar	do	3	no	-	no	no	self	no	no	do
95.JibonNahr	Nur Mohmd	do	1	no	-	no	no	-	no	no	do
96.Parul	Mojammel	do	2	no	-	no	no	-	no	no	do
97.Rehenahq	Nurul Hq	do	2	pacc a	self	no	yes	self	no	yes	do
98MaksudaBgm	A.Bari	do	3	do	do	no	yes	do	no	yes	do
99.Khoshjan	Gafur sk.	Berpara	2	lcost	dphe	no	yes	psha v	no	yes	do
100.Jahanara	MohorAli	do	3	do	do	no	yes	do	no	yes	do



STATUS OF WORD NO.7,8,9.

name	husband/father	village	family members	latrine type	latrine source	house connection	hand tubewell	HTW owner	sullage connection	water logging	waste disposal
1.Jahanara	Laltu	Gorostanpara	4	lcost	dphe	no	yes	-	yes	no	Pit
2.Arjina	JinnatAli	do	4	no	-	no	yes	-	yes	no	Pit
3.Arabi	Salam	do	3	no	-	no	yes	-	yes	no	Pit
4.Meharnnesas	Aijel	do	3	lcost	dphe	no	no	-	no	no	Pit
5.Jamela	Lafet	do	4	no	-	no	no	-	no	no	Pit
6.RomenaKhatn	HashemTalkdr	do	8	no	-	no	yes	-	yes	no	Pit
7.ChainaBgm	Anarul	do	4	lcost	dphe	no	no	-	no	no	Pit
8.JabedaBgm	ShoukatAli	do	5	lcost	dphe	no	yes	-	yes	no	Pit
9.Acemanu	Ashraf	do	7	lcost	dphe	no	yes	-	yes	no	Pit
10.Arjina	BabuShk	do	5	lcost	dphe	no	yes	-	yes	no	Pit
11.Marjina	Madar	do	6	lcost	dphe	no	no	-	no	no	Pit
12.Rejia	Harun	do	2	lcost	dphe	no	yes	-	yes	no	Pit
13.Nurjahan	Ansar	do	9	lcost	dphe	no	yes	-	no	no	Pit
14.Rokea	Abbas	do	4	lcost	dphe	no	no	-	yes	no	Pit
15.Manu	Anarul	do	5	lcost	dphe	no	no	-	no	no	Pit
16.bilkis	achibor	do	4	kacha	-	no	no	-	no	no	Pit
17.uni	Haider	do	3	lcost	dphe	no	no	-	no	no	Pit

18. Sonavanu	Amirul	do	4	lcost	dphe	no	no	-	no	no	Pit
19.Arjea	Rajjak	do	5	no	-	no	no	-	no	no	Pit
20.Rojina	Yusuf	do	3	no	-	no	no	-	no	no	Pit
21.Haluda	Amanul	do	8	lcost	dphe	no	no	-	no	no	Pit
22.Chaidani	Hakim	do	2	lcost	dphe	no	no	-	no	no	Pit
23.Achera	AbuHanif	do	8	lcost	dphe	no	no	-	no	no	Pit
24.Shefali	Shabu	do	4	lcost	dphe	no	yes	-	no	no	Pit
25.Sokhina	Jaker	do	7	lcost	dphe	no	no	-	no	no	Pit
26.Jahanara	Burun	do	5	lcost	dphe	no	no	-	no	no	Pit
27.Jahanara	AbuHosain	do	4	lcost	dphe	no	yes	-	yes	no	Pit
28.Arjina	Kalam	do	5	lcost	dphe	no	no	-	yes	no	Pit
29.Shirina	Ikarim	do	5	no	-	no	yes	-	yes	no	Pit
30.Achiron	Fuljar	do	7	lcost	dphe	no	no	-	yes	no	Pit
31.Fucanni	Shiraj	do	3	lcost	dphe	no	no	-	yes	no	Pit
32.Ferdosi	Ibrahim	do	5	lcost	dphe	no	no	-	no	no	Pit
33.Rebeka	Shaban	do	5	no	-	no	yes	psha v	no	no	Pit
34.Karimon	AbdulGani	do	5	lcost	dphe	no	yes	do	no	no	Pit
35.Rezia	Fajlu	do	3	lcost	dphe	no	yes	-	no	no	Pit
36.Charia	Icharuddin	do	3	lcost	dphe	no	yes	-	no	no	Pit
37.Shefali	Eanur	do	4	lcost	dphe	no	yes	do	no	no	Pit
38.rahima	Atar	do	2	lcost	dphe	no	no	-	no	no	Pit
39.Ahatan	KhodaBux	do	5	lcost	dphe	no	yes	-	no	no	Pit
40.Manchula	Jahiruddin	do	4	lcost	dphe	no	no	-	no	no	Pit

41.Choitan	AyubAli	do	2	lcost	dphe	no	yes	-	no	no	Pit
42.Alladi	Delbar	do	2	lcost	dphe	no	yes	pshav	no	no	Pit
43.Ramela	Abdul	do	2	lcost	dphe	no	no	-	no	no	Pit
44.Fannara	Moiraddi	do	5	lcost	dphe	no	yes	-	yes	no	Pit
45.Jahera	Chabdar	do	5	lcost	dphe	no	yes	-	yes	no	Pit
46.Pearon	Rafikul	do	5	lcost	dphe	no	yes	-	yes	no	Pit
47.Liluda	Malek	do	4	lcost	dphe	no	yes	-	yes	no	Pit
48.Chafela	Ramjan	do	6	lcost	dphe	no	no	-	yes	no	Pit
49.Dumi	BaburAli	do	5	lcost	dphe	no	yes	-	no	no	Pit
50.Shefa	Hanef	do	4	no	-	no	no	-	yes	no	Pit
51.Sonavanu	Alhamdu	do	5	no	-	no	no	-	no	no	Pit
52.Kohinurbg m	Hidatulla	do	4	no	-	no	yes	-	no	no	Pit
53.HafejaBgm	LutfarRahmn	do	6	lcost	dphe	no	yes	-	no	no	Pit
54.RafiaBgm	AfsarAli	do	3	no	-	no	yes	-	no	no	Pit
55.MariomBg m	GolamHosn	do	2	no	-	no	no	-	no	no	Pit
56.Meena	Mijanur	do	3	lcost	dphe	no	no	-	no	no	Pit
57.Begam	Kitab	do	3	lcost	dphe	no	no	-	no	no	Pit
58.Nachia	BillalJamal	do	4	lcost	dphe	no	yes	-	yes	no	Pit
59.Nisaron	Fajlu	do	6	lcost	dphe	no	yes	-	no	no	Pit
60.Mabia	NurIslam	do	4	no	-	no	no	-	yes	no	Pit
61.Jesmin	Kamruzzam an	do	3	no	-	no	yes	-	yes	no	Pit
62.Shukjan	Dabir	do	5	no	-	no	no	-	no	no	Pit

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63.Chanoara	Malek	do	4	lcost	dphe	no	yes	-	yes	no	Pit
64.Ojila	Latu	do	4	lcost	dphe	no	yes	-	yes	yes	Pit
65.Roushan	Shiraj	do	4	lcost	dphe	no	no	-	no	no	Pit
66.Rebeka	Khokon	do	2	no	-	no	yes	-	yes	no	Pit
67.Feroja	Shregul	do	4	no	-	no	no	-	no	no	Pit
68.Sharifon	Saiful	do	5	no	-	no	no	-	no	no	Pit
69.Rabia	Majid	do	4	no	-	no	yes	-	yes	no	Pit
70.AishaSddk a	Bablu	do	5	no	-	no	yes	-	yes	no	Pit
71.RoushanAr a	Shafikul	do	4	lcost	dphe	no	yes	-	yes	no	Pit
72.NaniBala	ShubalDas	do	9	no	-	no	yes	-	yes	no	Pit
73.Rokea	Khokon	do	3	no	-	no	no	-	yes	no	Pit
74.Sharifa	Easin	do	5	no	-	no	no	-	yes	no	Pit
75.Majeda	Salimuddin	do	5	no	-	no	no	-	yes	no	Pit
76.Jahida	Musad	do	4	lcost	dphe	no	yes	-	yes	no	Pit
77.Jharna	A.Bari	do	17	no	-	no	no	-	yes	no	Pit
78.KamrunNa hr	Shaidul	do	5	no	-	no	yes	-	no	no	Pit
79.Vanu	Ashraful	do	6	no	-	no	yes	-	no	no	Pit
80.Hasina	Shukur	do	5	lcost	dphe	no	yes	-	no	no	Pit
81.Shohagi	Fajjaddi	do	3	no	-	no	no	-	no	no	Pit
82.Halemon	Chabjan	do	2	lcost	dphe	no	no	-	no	no	Pit
83.Meheron	Nurlslam	do	6	lcost	dphe	no	no	-	no	no	Pit
84.Chakepa	HabibShk	do	5	no	-	no	no	-	no	no	Pit

85.LakhiKhatn	Jamiraddi	do	5	lcost	dphe	no	no	-	no	no	Pit
86.Rajia	Halim	do	3	no	-	no	no	-	no	no	Pit
87.Parvin	Shamsujoha	do	6	no	-	no	no	-	no	no	Pit
88.Shamsun	Humaun	do	9	no	-	no	yes	-	no	no	Pit
89.Ambia	Khabir	do	4	lcost	dphe	no	no	-	no	no	Pit
90.Taripon	Tagbir	do	2	lcost	dphe	no	no	-	no	no	Pit
91.Chafura	Jainaddin	do	4	lcost	dphe	no	yes	-	no	no	Pit
92.Fatema	KhodaBux	do	4	no	-	no	yes	-	no	no	Pit
93.Shahida	KhodaBux	do	10	lcost	dphe	no	yes	-	no	no	Pit
94.Geeta	-	do	4	no	-	no	yes	-	no	no	Pit
95.Jaida	FajalShk	do	20	no	-	no	yes	-	no	no	Pit
96.Chaira	Ajmat	do	6	no	-	no	yes	-	no	no	Pit
97.Anjira	Tikaruddin	do	8	lcost	dphe	no	yes	-	no	no	Pit
98.Khanam	Martuja	do	3	lcost	dphe	no	yes	-	no	no	Pit
99.Alia	Omar	do	5	lcost	dphe	no	yes	-	no	no	Pit
100.Shahina	OsmanGani	do	3	no	-	no	yes	-	no	no	Pit

Appendix-4 : Year wise waterborne diseases (as per record of Sadar hospital)

Year	Incidences
1993	9178
1994	14712
1995	12125
1996	4079
1997 (projected)	3850

Appendix-5 Water borne diseases recorded in the year 1995 (for total command area of the sadar hospital).

Month	Diarrhoea	Worm	Skin diseases	Jaundice	Total
January	272	285	262	19	838
February	240	232	306	05	783
March	272	264	255	04	795
April	357	432	334	03	1126
May	209	398	279	00	886
June	390	535	810	08	1743
July	380	490	550	15	1435
August	371	443	481	24	1319
September	257	442	399	35	1113
October	314	623	534	56	1527
November	229	488	394	50	1161
December	337	375	208	20	940

Total = 13660

Appendix-6 Water borne diseases recorded in the year 1996

Month	Diarrhoea	Worm	Skin diseases	Jaundice	Total
January	209	260	347	13	829
February	259	288	189	02	738
March	174	428	338	02	942
April	239	298	270	05	812
May	207	297	364	02	870
June	397	447	334	50	1228
July	408	516	378	12	1314
August	442	435	285	12	1174
September	407	412	360	12	1191
October	321	400	340	08	1069
November	284	336	359	64	1043
December	239	335	331	41	946
				Total =	12156

Appendix-7 Water borne diseases recorded from sadar hospital in 1997

Month	Diarrhoea	Worm	Skin diseases	Jaundice	Total
January	183	334	311	12	840
February	210	249	325	00	784
March	393	314	384	42	1133
April	262	375	208	20	865
May	229	186	36	00	451
June	337	375	208	18	938
				Total =	5011

Appendix-8 Year wise waterborne diseases recorded from sadar thana health office.

Month	Affected in 1995	Affected in 1996	Affected in 1997
January	18	3	14
February	13	5	10
March	19	17	17
April	14	11	14
May	15	17	21
June	22	17	36
July	21	18	-
August	20	21	-
September	20	16	-
October	13	25	-
November	17	6	-
December	11	16	-
Total	203	172	150 (projected)

Appendix-9 Waterborne diseases in 1997 (Mother & Child welfare center)

Month	Diarrhoea	Worm	Dysentery	Skin diseases	Total
January	07	42	14	20	83
February	07	11	07	06	31
March	05	29	20	17	71
April	33	31	14	33	111
May	10	29	02	10	51
June	04	45	04	02	55
				Total =	402



Appendix-10 Waterborne diseases in 1996

Month	Diarrhoea	Worm	Dysentery	Skin diseases	Total
January	6	12	18	12	48
February	5	11	16	14	46
March	18	18	10	17	63
April	14	13	10	29	66
May	20	16	16	15	67
June	35	23	27	12	97
July	10	58	25	16	109
August	4	21	22	25	72
September	9	23	16	17	65
October	2	11	6	10	29
November	5	9	11	13	38
December	5	13	11	8	37
Total	133	228	188	188	737

