Health Economics Unit
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Calculation of total unit cost for diarrhoeal management at district hospital and Thana Health Complex

Research Paper 20

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Also available;

Public-private mix for health sector development: proceedings of the fourth annual conference, 25-26th July 1999

Bangladesh National Health Accounts 1996/97, Final report, Data International/ Health Economics Unit.

Contents

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Abbreviations

Av	=	Average
ICDDR, B	=	International Center for Diarrhoeal Disease Research, Bangladesh
BBS	=	Bangladesh Bureau of Statistics
BHDS	=	Bangladesh Health and Demographic Survey
DGHS	=	Director General of Health Services
ETW	=	Electricity, Water and Telephone
F-M	=	Fuel and Maintenance
GED	=	General Economic Division
GOB	=	Government of Bangladesh
IPD	=	In-patient Department
MO	=	Medical Officer
MOF	=	Ministry of Finance
MOHFW	=	Ministry of Health and Family Welfare
No	=	Number
OPD	=	Outpatient Department
Sq.ft	=	Square feet
SVR	=	Sample Vital Registration
THA	=	Thana Health Administrator
THC	=	Thana Health Complex
Tk	=	Taka (Unit of Bangladesh currency)
WHO	=	World Health Organization
Yr	=	Year
UNICEF	=	United Nations Children Fund

Executive summary

Diarrhoea is a water borne communicable disease and is a major public health problem in Bangladesh. Information on the costs for the operation and management of diarrhoeal cases is vital in understanding and improving the effectiveness of the programme.

The objective of the study is to calculate the unit cost of the provider in IPD and OPD of District Hospital and Thana Health Complex for the management of diarrhoea. This information is vital in understanding for planning the patient service for improving the effectiveness of the program as well as to charge the patient.
Provider costs in District Hospital and Thana Health Complex at Manikgonj District in Bangladesh were calculated through a retrospective survey and observations in 1997. Different cost components were identified from providers' perspective e.g., capital and recurrent cost items.

The estimated provider cost per patient day for the management of IPD cases at District Hospital was Tk 317.87, at Thana Health Complex it was Tk 406.90. Cost per OPD visit at District Hospital was Tk 53.74 and at Thana Health Complex it was Tk 63.32.

This study found that the provider cost for the treatment of diarrhoeal patients at District Hospital and at Thana Health Complex- the maximum cost component was the capital cost, followed in order by the labor and material costs. In District Hospital percentage of costs shared by capital, labor and material was 41.4%, 25.7% and 23.3% where as in Thana Health Complex it was 44.1%, 29.8% and 19.0% respectively of the total unit cost.

Average provider cost at IPD and OPD of District Hospital was much less than that of Thana Health Complex. This is mainly because of nearly full utilization of District Hospital and under utilization of Thana Health Complex and also may be District Hospital is more efficient and effective in their services.

Improving health facilities with the quality of services at rural level with higher efficiency worth considering to reduce excessive pressure at District Hospital and to increase the utilization of Thana Health Complex. Increased utilization will reduce the capital and also some recurrent costs at Thana Health Complex, as higher cost borned by the provider at rural level and patient at District level.

User charge may be introduced up to District level to recover at least recurrent costs of material according to financial solvency of the patients and should introduce referral system so that only more severe cases could be referred to District level and non-severe cases should be treated locally.

Introduction

Disease profile of Bangladesh shows that diarrhoea ranks first and causes major problem of morbidity and mortality specially among the children throughout the year. International Center for Diarrhoeal Disease and Research, Bangladesh (ICDDR, B), in 1994 conducted a survey and indicated that 20 and 30% of all deaths are due to diarrhoeal diseases. According to the Ministry of Health and Family Welfare (MOHFW), Government of Bangladesh (GOB) Report, 1997 shows that disease rate is 14.27% and total death rate is 2.6%. Each year 25% of the total death of children under 5-years caused by diarrhoea.

About 47% of the population of the country lives under poverty line (Economic Review, Ministry of Finance, GOB, 1997) mostly lives in rural areas. It is difficult for them to manage the disease. In this situation control of diarrhoea is difficult. On the other hand financial scarcity especially from the public side is also a great challenge for planners and decision maker.

Health Information Report, 1996 showed that the incidence rate of diarrhoeal diseases is higher in rural areas (6.99%) than urban areas (5.95%). Among the ten leading causes of morbidity diarrhoea, the most common disease in Bangladesh, still dominates the morbidity pattern of the country accounting for 14.27 % while the death rate is 2.6 % (MOHFW, 1997).

Though there are great advancements in medical sciences still diarrhoeal management in Bangladesh remains a major problem with high morbidity and mortality.

The epidemic creates each year acute public problem and is a great burden to the health services of the country and some times the epidemics become unmanageable because of scarce public resources. Every year during the rainy season flooding occurs which also aggravates the situation. Sub-urban and rural people suffer most, mainly because of lack of safe drinking water and also because of a lack of knowledge of general hygiene.

For communicable disease control programme provision of sanitary latrine and safe water supply for drinking and washing are necessary. Safe water supply and especially sanitary measures required to combat the problem. Households coverage

only for safe drinking water is 96.5% but for other purposes like washing, cooking etc. and using sanitary latrines it is only 21.3% (BBS, 1996).

In Bangladesh the health care seeking behavior of the rural people is different and with different attitudes towards (rural) public health care facilities. During their illness they primarily follow some ayurvedic medicine/ traditional healer/ homeopath though they are nearly close to modern health complexes. When the patient condition becomes very worse/bad then they usually rush to the district hospital by passing the health complexes.

Most of the district hospitals are located far from a patients' home. District hospitals usually remains over crowded and waiting times are long. In this situation rural people are to wait longer and spend more to get services and manage the disease. But still they use district hospital especially for in-patient care. Information about the reasons why people seek hospital care may be useful to re-plan the disease control strategy.

Cost of management for the disease from the provider's side at different levels are not yet measured and estimation will be helpful for re-plan the patient service for efficient management of the disease so that best utilization of scarce public as well as individual resources could be possible.

In addition it may be helpful for introducing appropriate service / user charges as a cost recovery measure for health care services at different level justified from patients' perspective and financial solvency.

Finally it will stimulate further health economics studies in health sector.

Research methodology

2.1 Study Design

A descriptive case study, a retrospective survey was conducted for collecting information about cost items related to diarrhoeal disease management in Manikgonj District Hospital and Singair Thana Health Complex . Singair Thana Health Complex is in Manikgonj District.

2.2 Data/Information Collection

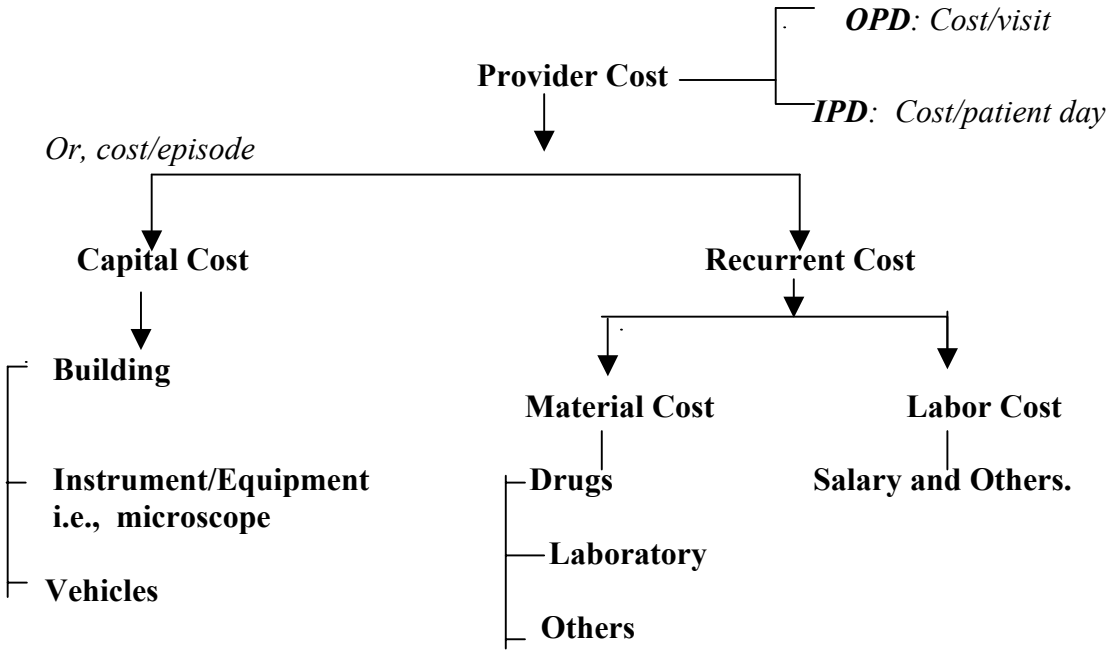
Data were collected through survey hospital records, observation and interview with the hospital authority to analyze the costs of treatment for diarrhoeal patients in the outpatient and in-patient departments of the District Hospital and Thana Health Complex from providers' perspective through field visits are as follows:

- **a.** Organogram and information on infrastructures such as area of different departments/units in square feet for allocating the costs for diarrhoea ;
- **b.** Number and type of staff working in the organizations with their monthly salary structure and benefits to calculate the recurrent cost for diarrhoeal patient service;
- **c.** Electricity, Telephone and Water bill (ELECTRICITY-TELEPHONE-WATER), Fuel and Maintenance (FUEL-MAINTENANCE) costs;
- **d.** Total number of in and out patients with average number of days stay in the IPD;
- **e.** Total number of routine laboratory tests for all diseases for IPD and OPD and number of routine laboratory tests for diarrhoeal IPD and OPD;
- **f.** Total material cost including laboratory tests and drugs for OPD and IPD of diarrhoea and also food cost for IPD per patient day;
- **g.** Time spent for patient service, timre/routine test by related staffs and also other activities by related staffs to calculate their salary cost for diarrhoea ;
- **h.** Information about cost and buying or making year of capital inputs, life time of the capital inputs, banking loan rate and scrap value rate at 1997 in

order to estimate average annual costs of the capital cost items related to diarrhoeal patient service.

2.3 Conceptual Framework of Costing (Provider) :

Figure 2.1:The Different Cost Components Incurred by the Provider for Hospital Care and Services.



2.4 Data Analysis

Costs by inputs are classified here into two groups: Capital items are those that last longer than one year, including buildings, equipment, vehicles etc. Recurrent items are those that are used up in the course of a year and usually purchased regularly, such as drugs, minor instruments, salary etc (Phillips *et al*, 1993).

First of all costs data were grouped into capital cost and recurrent cost items. Capital cost items related with diarrhoeal patient services were building with furniture and fixtures, ambulance, jeep, microscope, motorcycle and water pump machine.

Recurrent cost items were the salary cost of administration for support to patient services and to reallocate them to IPD and OPD of diarrhoea, salary costs of personnel directly related to diarrhoeal patient services , ELECTRICITY-TELEPHONE-WATER and FUEL-MAINTENANCE cost, drug cost, laboratory cost and others.

2.4.1 Calculation of Capital Costs:

All the costs were evaluated at 1997 price and then calculated average annual costs of all capital cost items for diarrhoeal management. Annual cost of each capital cost item is then calculated using the following formula:

$AC_k = \{C_{to} (1+ r)^{1997-to} - S_n / (1+ r)^{n-1997} \}/n$; where,

AC_k = Average annual cost of the capital cost item/asset in 1997

C_{to} = The purchase value or making cost of that capital cost item at the year bought or made; r = Loan rate during the period of study;

t_o = Purchase / making year ; n = Life (years) of the capital item.

S_n = Scrap value at the end of life of capital item (n years) which has scrap value. Some items have scrap value and some donot have also brought under consideration during calculation.

All the costs were evaluated at 1997 price and then calculated average annual costs of all capital cost items for diarrhoeal management. To calculate the average annual costs of capital cost item/asset the following information is needed :

- bought /made in year with value of the items/assets.
- life time of items/assets
-domestic loan rate in 1997
-scrap value rate in 1997

Annual cost of each capital cost item is then calculated using the following formula:

$$\mathbf{AC_k = \{C_{to} (1+ r)^{1997-to} - S_n / (1+ r)^{n-1997} \}/n}$$

where:

AC_k = Average annual cost of the capital cost item/asset in 1997
C_{to} = The purchase value/making cost of that capital item at the year bought/ made
r = Loan rate during the period of study
t_o = Purchase / making year
S_n = Scrap value at the end of life of capital item (n years) which has scrap value
n = Life (years) of the capital item.

The annual capital cost of the Jeep of District Hospital is then calculated as follows:

Purchase value of the Ambulance = 1,200,000 Tk,
Loan rate during the study period = 14 %,
Study period = 1997,
Purchase year = 1992,
Scrap value at the end of life of item = 5% of the value of the item at purchase

equals 1,200,000 * 0.05 =60,000 Tk

Life of the Jeep = 10 years and it will end in the year 2001,

Hence, annual cost of the Jeep = $\{1,200,000\ (1+0.14)^{1997-1992} - 60,000/(1+0.14)^{2001-1997}\}/10$ Tk = $\{1,200,000\ (1+0.14)^5 - 60,000/(1+0.14)^4\}/10$ Tk = (2310497.50 - 35524.82)/ 10 Tk = 2,274,972.68/10 Tk=227,497.27 Tk

Similarly average annual costs of the capital cost items of District Hospital and Thana Health Complex were calculated. Some items have scrap value and some do not have scrap value and they were also brought under consideration during calculation. The items which don't have scrap value in that case the formula for calculation of average annual cost of the item is

$$AC_k = \{C_{to}\ (1+r)^{1997-to}\}/n$$

where,

AC_k = Average annual cost of the capital cost item/asset at 1997 price
C_{to} = The purchase cost of that capital item at the year bought/made
r = Loan rate during the period of study
t_o = Purchase / making year
n = Life (years) of the capital item.

Note that in 1997 US$ 1 equal to Tk 47.00 .

Table 2.1: Summary of Capital Costs at District Hospital and Thana Health Complex for Diarrhoeal IPD and OPD in 1997.

Cost Items	**District Hospital**		**Thana Health Complex**	
	Cost for IPD (Tk)	Cost for OPD (Tk)	Cost for IPD (Tk)	Cost for OPD (Tk)
Building	298,008.90	62,100.06	128,521.40	50,702.60
Jeep	18,996.02	3,958.45	0.00	0.00
Ambulance	4,185.64	3,264.03	8,507.00	14,744.2
Microscope	1,538.56	452.23	963.30	0.00
Water Pump	4,573.50	953.00	6,143.40	2,423.60
Motor cycle	0.00	0.00	7,326.30	2,890.30
Reallocated Capital Cost	***25,313.03***	***19,739.52***	***12,715.70***	***22,038.70***

of Admin.				
Total	**352,615.65**	**90,467.30**	**164,177.10**	**92,799.40**

2.4.2 Variable Cost Calculation Method

In this study total and average cost of the provider calculated. Average provider cost = Total provider cost/ Total number of patients treated.

- Variable/recurrent costs are basically calculated as the sum of all the inputs used. Cost of each inputs calculated as unit cost of that Input and then multiplied by the total units used.
- Total drug cost calculated by the item of drug multiplied by unit of drugs multiplied by market price of the unit of drug for the year provided to the patients.
- Average drug cost = Total drug cost for the year/total number of patients treated.
- Total laboratory cost = Summation of all individual laboratory cost materials/year.
- Average laboratory cost = Total laboratory cost/total number of tests for the year.
- Total salary cost of administration and also total cost of Electricity, Telephone and Water and Fuel and Maintenance collected from hospital records in 1997 and then allocated to diarrhoeal IPD and OPD following appropriate allocation criteria.
- Food cost/patient/day was 30.00 Tk in 1997 and then total food cost find out by multiplying it by total number of patient days for diarrhoeal IPD in 1997.

Salary of personnel for patient service of diarrhoeal IPD and OPD calculated in the following way.

First annual salary cost of the personnel related to diarrhoeal patient service in 1997 was collected from hospital records based on total working hour/year/person (365 days in a year * 8 hours work/person/day). So salary costs of each person were obtained by dividing each person's total salary cost/year by total working hour/year. Total amount of time spent by each person for patient service was calculated by

multiplying the time spent by each person/patient/day in IPD and per person/visit in OPD by the total number of patient days at IPD and patients at OPD in 1997. This was then multiplied by each person's per hour salary cost for diarrhoeal IPD and OPD separately and then all personnel costs added together to get total cost for IPD and OPD to divide staff cost per patient.

Annual recurrent cost of recurrent cost items of District Hospital and Thana Health Complex are summarized in Table 2.2.

Table 2.2: Summary of Recurrent Costs at District Hospital and Thana Health Complex for Diarrhoeal IPD and OPD in 1997.

Cost Items	**District Hospital**		**Thana Health Complex**	
	Cost for IPD (Tk)	Cost for OPD (Tk)	Cost for IPD (Tk)	Cost for OPD (Tk)
Salary of Administration	39,851.10	31,076.50	34,134.60	59,161.80
ELECTRICITY-TELEPHONE-WATER and FUEL-MAINTENANCE of Vehicle	57,225.00	44,625.00	15,103.10	26,176.40
Salary (patient Service)	182,101.60	22,406.87	62,085.87	18,544.00
Material (drugs and tests)	61,694.49	114,916..50	23,007.60	63,808.14
Food	72,270.00	0.00	23,760.00	0.00
Total	**413,141.20**	**213,024.90**	**158,091.20**	**167,690.30**

2.4.3 Allocation Criteria for Annual Costs

At District Hospital allocation of the calculated annual capital cost of the building, water pump machine and jeep were done on the basis of the percent of total space area (square feet) covered by administration department, in-patient department and outpatient department. Allocation of the building cost of the District Hospital was done by the following way:

1. *Total building area of District Hospital = 23,814 sq.ft.*

2. *Space for administration department = 2,873 sq.ft.*
3. *Administration department covers =(2,873 / 23,814)*100=12.06% of hospital building area,*
4. *Similarly OPD covers=(4,289.25/23,814)*100 =18.01% of hospital building area;*
5. *IPD covers = (16,551.75 / 23,814) * 100 = 69.93 % of building area;*
6. *In 1997 number of OPD patients of all diseases was 58,478 and number of diarrhoeal patients was 5647 and this was (5,647/58,478)*100 or 9.66% of OPD;*
7. *So diarrhoeal OPD covers = 4,289.25 sq.ft * 9.66% = 4,289.25 sq.ft * 0.0966= 414.2 sq.ft of the hospital building area and is = (414.2 / 23,814)*100 =1.74 % of hospital building area;*
8. *At District Hospital diarrhoeal IPD space was earmarked and it was 1,988 sq.ft. So diarrhoeal IPD covers (1,988 / 23,814) * 100 = 8.35 % of total hospital area;*
9. *In 1997 average annual building cost was 3,568,969.00 Tk;*
10. *So, building cost allocated to administration department=3,568,969.00 Tk * 12.06 % = 3,568,969.00 Tk * 0.1206 = 430,417.70 Tk,*
11. *Building cost to diarrhoeal OPD =3,568,969.00 Tk * 1.74%= 62,100.06 Tk*
12. *Building cost to diarrhoeal IPD = 3,568,969.00 Tk * 8.35 % = 298,008.90 Tk*
13. *Similarly capital costs of water pump machine and jeep allocated to the departments mentioned above.*

The cost of three capital items of administration (indirect cost for patient service or cost for support service) were reallocated to patient service departments i. e., OPD and IPD of diarrhoea based on use weights for patients in OPD and IPD. ,Outpatient department remains open 8 hours/day to provide patient service but in-patient department is 24 hours open and the patients getting services and also using all hospital facilities. It was assumed that one in-patient patient/day equivalent to three outpatient days or three OPD visit. At District Hospital total outpatient days was 132,740 and at OPD it was 58,478 and at IPD it was 74,262 ;

- So OPD covers = (58,478 / 132,740)*100 = 44.05 % of total outpatient days;
- IPD covers = (74,262 / 132,740)*100=55.95 % of total outpatient days;
- Total outpatient days at diarrhioeal OPD was 5,647 and at IPD was 7227 ;
- So diarrhoeal OPD covers=(5,647/132740)*100=4.25%of total outpatient days;
- Diarrhoeal IPD covers =(7,227/132,740)*100 = 5.45 % of total outpatient days;

- Then capital cost for administration in 1997 at District Hospital reallocated to diarrhoeal OPD and IPD at the rate of 4.25% and 5.45% respectively.
- Capital item ambulance is only for patient service i.e., for OPD and IPD patients. Ambulance annual cost allocated to OPD and IPD of Diarrhoea at the rate of 4.25% and 5.45% because dirrhoeal OPD patients covers 4.25% of total OPD patients and diarrhoeal IPD patients covers 5.45% of total IPD patients.

Annual capital cost of microscope was allocated on the basis of total number of tests done for IPD and OPD of all diseases and then allocated to diarrhoeal OPD and IPD on the basis of number of tests done for diarrhoeal OPD and IPD.

At District Hospital allocation of annual recurrent cost of ELECTRICITY-TELEPHONE-WATER and FUEL-MAINTENANCE and salary of administration (support or auxiliary service cost) to diarrheal OPD and IPD was done at the rate of 4.25% and 5.45% respectively.

Recurrent cost of salary for direct patient service was calculated on the basis of time spent by the personnel for diarrheal OPD and IPD patients and then allocated directly;

Some personnel's service is only for IPD in that case their proportionate annual salary cost was allocated to diarrheal IPD on the basis of total inpatient days e.g., cook is only for IPD and diarrheal IPD patients covers 9.73% of total IPD patients and for that reason cook's annual salary's 9.73% allocated to diarrheal IPD directly; and

Some personnel's service is directly for both OPD and IPD patients and their service time can not be separated into time per patient, so their salary is proportionately allocated on the basis of total number of outpatient days e.g., ambulance driver is for both the patients at OPD and IPD and his time cannot be separated into per patient for allocation of his salary cost and in this case ambulance driver's annual salary cost allocated to diarrheal OPD and IPD according to it's coverage i.e., at the rate of 4.25% and 5.45% respectively.

Total material costs (including drugs and tests) for OPD and IPD of District Hospital and Thana Health Complex provided by the Civil Surgeon of the district .

Similarly allocation of the calculated average annual costs of capital cost items and recurrent costs were done to the diarrhoeal OPD and IPD to know the annual capital and recurrent costs as well as total cost of the provider for diarrheal disease management at Thana Health Complex. Capital and recurrent costs are added together for both units in the District Hospital and Thana Health Complex.

Computed costs per visit in OPD of diarrhoea by dividing the annual total costs of OPD by the total number of OPD patients or visits in 1997. Computed cost per patient day in IPD of diarrhoea by dividing the annual total costs of IPD by the total number of patient days at IPD in 1997. Computed cost per episode in IPD of diarrhoea by dividing the annual total costs of IPD by the total number of patients at IPD in 1997.

Empirical results

3.1 Provider Cost

In the analysis of the cost of treatment for Diarrhoeal patients at District Hospital and Thana Health Complex it was found that the maximum cost component was the capital cost, followed by labor and the material costs. In district hospital percentage of costs shared by capital, labor and material was 41.4%, 25.7% and 23.3% and in Thana Health Complex was 44.1%, 29.8% and 19.0% respectively (Tables 3.1 and 3.2). This implies that higher utilization can significantly help to reduce the average cost of treatment.

However, the capital cost plays a lesser role in OPD than in IPD. In District Hospital at OPD the capital, labor, material and Electricity-Telephone-Water and Fuel and Maintenance costs had shares of 29.8 %, 17.6 %, 37.9 % and 14.7 % respectively of the total unit cost i.e., the average cost per OPD visit (Table 4.1). In the IPD of District Hospital, the capital, labor, material, Electricity-Telephone-Water and Fuel and Maintenance and food costs had the shares of 46.0 %, 29.0 %, 8.1%, 7.5 % and 9.4 % respectively of the total unit cost i.e., the average cost per patient day (Table 3.1).

It was found that in the District Hospital average cost of provider for an OPD visit by diarrhoeal patients was 53.74 Tk. Average cost per patient day it was 317.87 Tk and average cost per episode was 953.62 Tk for diarrhoeal patients at IPD (Table 3.1).

Table 3.1.1: Total and Average Costs for Diarrhoeal Patients at OPD and IPD of District Hospital in 1997.

Cost items	**1** OPD cost per year (Tk)	**2** **OPD cost / patient (Tk)**	**3** % of total cost/ patient at OPD	**4** IPD cost Per year (Tk)	**5** ***IPD cost/ Patient Day (Tk)***	**6** %of total cost/ patient day at IPD	**7** ***Cost per Episode At IPD (Tk)***	**8** Total cost (OPD+ IPD) /year (Tk)	**9** %of total cost (OPD +IPD) /year
Capital	90467.3	16.02	29.8	352615.6	146.37	46.0	439.12	443082.9	41.4
Salary (Administration)	31076.5	5.50	10.2	39851.1	16.54	5.2	49.63	70927.6	6.6
Salary (Patient Service)	22406.9	3.97	7.4	182101.6	75.59	23.8	226.78	204508.5	19.1
Electricity-Telephone-Water And Fuel-Maintenance	44625.0	7.90	14.7	57224.0	23.75	7.5	71.26	101849.0	9.5
Material (Drugs and tests)	114916.5	20.35	37.9	61694.5	25.61	8.1	76.83	176611.0	16.5
Food	0	0.00	0.0	72270.0	30.00	9.4	90.00	72270.0	6.8
Total	303492.2	**53.74**	100.0	765756.8	***317.87***	100.0	***953.62***	1069249.0	100.0

Notes:

- Total number of diarrhoeal patient at OPD =5647 in 1997.
- Total number of diarrhoeal patient at IPD = 803 in 1997.: Average number of days stay at IPD was 3 in 1997.
- Total number of patient days at IPD=803*3 =2409 in 1997.
- Column 2=Column 1 / 5647; Column 3=(Column 2/ 53.74)*100; Column 5=Column 4 / 2,409
- Column 6=(Column 5 / 317.87)*100; Column 7=Column 5*3; Column 8=Column 1+Column 4
- Column 9=(Column 8 / 1,069,249.0)*100

In the Thana Health Complex it was found that the average provider cost per patient for an OPD visit was 63.32 Tk. In case of IPD cost per episode was 813.81 Tk and cost per patient day was 406.90 Tk for diarrhoeal patient (Table 3.2).

In terms of shares, in Thana Health Complex at OPD the capital, labor, material and Electricity-Telephone-Water and Fuel and Maintenance costs had the shares of 35.6 %, 29.8 %, 24.5 % and 10.0 % respectively of the total unit cost i.e., the average cost per OPD visit of the Thana Health Complex (Table 3.2).

In IPD the capital, labor, material, Electricity-Telephone-Water and Fuel and Maintenance and food costs had the shares of 50.9 %, 29.9 %, 7.1 %, 4.7 % and 7.4 % respectively of the total unit cost i.e., the average cost per patient day in IPD of Thana Health Complex (Table 3.2).

Table 3.1.2: Total and Average Costs for Diarrhoeal Patients at OPD and IPD of Thana Health Complex in 1997.

Cost items	**1** OPD cost per year (Tk)	**2** **OPD cost/ patient (Tk)**	**3** % of total cost/ patient at OPD	**4** IPD cost Per year (Tk)	**5** ***IPD cost/ Patient Day (Tk)***	**6** %of total cost/ patient day at IPD	**7** ***Cost/ Episode At IPD (Tk)***	**8** Total cost (OPD+ IPD) /year (Tk)	**9** % of total cost (OPD+ IPD) /year
Capital	92799.4	22.56	35.6	164177.1	207.29	50.9	414.59	256976.5	44.1
Salary (Administration)	59161.8	14.38	22.7	34134.6	43.10	10.6	86.20	93296.4	16.0
Salary (Patient Service)	18544.0	4.51	7.1	62085.9	78.39	19.3	156.78	80629.9	13.8
Electricity-Telephone-Water And Fuel-Maintenance	26176.4	6.36	10.0	15103.1	19.07	4.7	38.14	41279.5	7.1
Material (Drugs and tests)	63808.1	15.51	24.5	23007.6	29.05	7.1	58.10	86815.7	14.9
Food	0.0	0.00	0.0	23760.0	30.0	100.0	60.00	23760.0	4.1
Total	260489	**63.32**	100.0	322268.3	***406.90***		***813.81***	582758.0	100.0

Notes: Total number of diarrhoeal patient at OPD= 4,114; and at IPD= 396 in 1997.

- Average number of days stay at IPD was 2 in 1997: Total number of patient days at IPD=396*2 =792 in 1997.
- Column 2=Column 1 / 4,114; Column 3=(Column 2 / 63.32)*100; Column 5=Column 4 / 792;
- Column 6=(Column 5 / 406.90)*100; Column 7=Column 5 * 2; Column 8=Column 1+ Column 4
- Column 9=(Column 8 / 582,758.0)*100.

3.2. Patient Cost-A Comparison

To analyse the total costs of treatment it is important to know the cost of both patients and providers. In this study costing for the operation of diarrhoeal disease from patients' perspective did not done because of limitation of available resources and time. However, some patients, cost can be estimated by applied some basic assumptions to the results and figures from Begum (1995).

Begum (1995) carried out a study about cost analysis of childhood diarrhoeal inpatients at Narayangonj District Hospital (General Hospital), Bangladesh from patients' perspective. In her study it was found that in 1995 rural people incurred cost per patient 1,989.59 taka and urban people incurred 1,465.40 taka per patient for IPD of diarrhoea in district hospital.

Table 3.2.1: Average Treatment and Associated Cost for the Management of Diarrhoea incurred by Rural people at IPD per Episode in District Hospital in 1995 and cost at 1997 price.

Cost category	Cost at 1995 price (Tk)	Cost at 1997price = 1995 price (1+0. 14)^2
Registration Fee	8.00	10.40
Bed Cost	25.85	33.59
Medical cost	314.23	408.37
Laboratory Cost	248.38	322.79
Food cost (patient)	200.75	260.89
Food cost (attendant)	496.36	645.07
Wage lost (attendant)	569.63	740.29
Travel cost (attendant)	126.36	164.22
Total	1989.56	2585.63

Source: M Sc Thesis on "Cost analysis of Childhood Diarrhoeal in-patients: A case study of Narayangonj District Hospital , Bangladesh" by Begum, S.A. 1995.

To be comparable in this study, the patient cost will be measured at 1997 price. Unit cost of rural patient including earning lost by the attendants/parents = 1,989.59 $(1+0.14)^2$ = 2,585.67 taka

Where:

1,989.59 Tk = The average cost/patient at IPD of District Hospital at 1995,

0.14 = Bank Loan Rate

^{2} = Time expressed in year = (1995-1997)

Taking into account the result and some figures from Begum's study and on the basis of some assumptions made, patient cost per patient day in IPD and cost per visit in OPD at District Hospital and Thana Health Complex can be estimated at 1997 price as follows:

- Patient cost at IPD in District Hospital per episode = 2,585.63 taka
- Hence, patient cost at IPD in District Hospital per patient day=2,585.63/6=430.94 taka (where on average IPD treated 6 days).
- Estimated patient cost/visit at OPD in District Hospital ={Patient cost at IPD
- in District Hospital - (Registration fee + Bed cost + Food cost + Wage lost)}/6= {2,585.63 - (10.40+33.59+260.89+645.07+740.29)}/6=895.39/6=149.23 taka

- Estimated patient cost per patient day at IPD in THC = (IPD patient cost per episode at district hospital - Travelling cost) / 6 = (2,585.63 - 164.22) / 6= 403.57 taka

- Estimated patient cost/visit at OPD in THC = (Patient cost at OPD of district hospital - Travelling cost) / 6 = (895.39-164.22)/6 = 731.17/6 =121.86 taka

It is to be noted that-

(1) Narayangonj District Hospital is a tertiary care general hospital and the average length of stay of the diarrhoeal patient at IPD was 6 days.
(2) It was also assumed that one in-patient day at IPD equivalent to one OPD visit.
(3) All the calculations made at 1997 price.
(4) It was assumed without loosing generality that in-patient cases were the severe cases and outpatient cases were the non-severe cases.

It was also noted that only in the Thana Health Complex provider cost for the management of severe cases i. e., in the IPD was higher than that of the patient cost.

Patient costs were higher than that of provider cost in IPD and OPD of District Hospital and also in the OPD of Thana Health Complex (Table 4.2). This may indicate that Thana Health Complex provides inefficient service for IPD i.e., for severe cases (the significant higher provider cost). The lower utilization rate could be a part of the high average provider cost in Thana Health Complex.

Table 3.2.2: A Comparison of Average Provider Costs, Patient Costs and Total Costs at IPD and OPD of District Hospital and Thana Health Complex in 1997.

	IPD (severe cases)		OPD (non-severe cases)	
	Cost/patient Day at District Hospital	Cost/Patient day at Thana Health Complex	Cost/OPD visit at District Hospital	Cost/OPD visit at Thana Health Complex
Provider Cost (value at 1997 price)	**317.87** (42.45%)	406.90 (50.20%)	**53.74** (26.48%)	63.32 (34.19%)
Patient Cost (value at 1997 Price)	***430.94*** (57.55%)	*403.57* (49.80%)	***149.23*** (73.52%)	*121.86* (65.81%)
Total	748.81 (100%)	810.47 (100%)	202.97 (100%)	185.18 (100%)

Sources : Tables 3.1, 3.2 and 3.2.1.

Table 3.2.3: A comparison of Average Recurrent cost of Provider's, Patient's and Average Total Recurrent Costs at IPD and OPD of District Hospital and Thana Health Complex in 1997.

Recurrent cost	IPD cost/patient day (Tk)		% of cost difference Between DH & THC	OPD cost/visit (Tk)		% of cost difference between DH & THC
	DH	THC		DH	THC	
Provider cost (value at 1997 price) (% of total)	171.50 (28.47)	199.61 (33.10)	DH 16.39% Less than THC	37.72 (20.17)	40.76 (25.07)	DH 8.06% Less than THC
Patient cost (value at 1997 price) (% of total)	430.94 (71.53)	403.57 (66.90)	DH 6.78% Higher than THC	149.23 (79.83)	121.86 (74.93)	DH 22.46% Higher than THC
Total	602.44 (100%)	603.18 (100%)	DH 0.12 % Lower than THC	186.95 (100%)	162.62 (100%)	DH 14.96% Higher than THC

Sources : Tables 3.1, 3.2.4 and 3.2.5 .

Table3.2.4: Total and Average Costs for Diarrhoeal Patients at OPD and IPD of Thana Health Complex in 1997.

Cost items	***1*** *OPD cost per year (Tk)*	***2*** ***OPD cost/ patient (Tk)***	***3*** *% of total cost/ patient at OPD*	***4*** *IPD cost Per year (Tk)*	***5*** ***IPD cost/ Patient Day (Tk)***	***6*** *%of total cost/ patient day at IPD*	***7*** ***Cost/ Episode At IPD (Tk)***	***8*** *Total cost (OPD+ IPD) /year (Tk)*	***9*** *% of total cost (OPD+ IPD) /year*
Capital	*92799.4*	*22.56*	*35.6*	*164177.1*	*207.29*	*50.9*	*414.59*	*256976.5*	*44.1*
Salary (Adminis-tration)	*59161.8*	*14.38*	*22.7*	*34134.6*	*43.10*	*10.6*	*86.20*	*93296.4*	*16.0*
Salary (Patient Service)	*18544.0*	*4.51*	*7.1*	*62085.9*	*78.39*	*19.3*	*156.78*	*80629.9*	*13.8*
ETW and FM	*26176.4*	*6.36*	*10.0*	*15103.1*	*19.07*	*4.7*	*38.14*	*41279.5*	*7.1*
Material (Drugs and tests)	*63808.1*	*15.51*	*24.5*	*23007.6*	*29.05*	*7.1*	*58.10*	*86815.7*	*14.9*
Food	*0.0*	*0.00*	*0.0*	*23760.0*	*30.0*	*7.4*	*60.00*	*23760.0*	*4.1*
Total	*260489.7*	***63.32***	*100.0*	*322268.3*	***406.90***	*100.0*	***813.81***	*582758.0*	*100.0*

Table 3.2.5: A Comparison of Cost Components of Provider between IPD and OPD of Thana Health Complex in 1997.

Cost items	*IPD Cost/year (Tk)*	*OPD Cost/year (Tk)*	*Remarks*
Capital	***164,177.1***	***92,799.4***	*IPD cost 1.77 times higher than OPD*
Salary (Administration)	*34,134.6*	*59,161.8*	*IPD cost 1.73 times lower than OPD*
Salary (Patient Service)	*62,085.9*	*18,544.0*	*IPD cost 3.35 times higher than OPD*
ETW and FM	*15,103.1*	*26,176.4*	*IPD cost 1.73 times lower than OPD*
Material (including tests and drugs)	*23,007.6*	*63,808.1*	*IPD cost 1.86 times lower than OPD*
Food	*23,760.0*	*0.0*	*OPD do not have any food cost*
Total	***322,268.3***	***260,489.7***	*Total IPD cost 1.24 times higher than OPD*

In case of IPD of District Hospital and Thana Health Complex the total average costs were similar for cost per patient day and it was 602.44 taka and 603.18 taka respectively. But in OPD average total cost per visit was about 15% higher (Table 3.2.3) in District Hospital than Thana Health Complex .

Individually average recurrent costs of the provider both at IPD and OPD of District Hospital was lower than that of Thana Health Complex and it was 16.39% and 8.06% respectively. Average recurrent cost of the patient also lower in both cases at Thana Health Complex than District Hospital and it was about 7% in IPD cost /patient day and 22.46% in OPD cost /visit. This was because of patients incur less travel and food cost, may incur less wage lost.

Taking into consideration of patient perspective, non-severe case (OPD) should be encouraged to seek treatment in Thana Health Complex because of lower cost (22% lower). However, severe case like IPD, District Hospital performed better and should be encouraged to serve by at least two reasons. First, average provider cost is much lower (16% less of IPD compared to 8% less of OPD case). Second, though patient cost is higher for both IPD and OPD cases due to travel and food cost, it is only 7% higher in District Hospital than Thana Health Complex for IPD cases compared to 22% higher for OPD cases. Moreover, if taking into consideration that quality of District Hospital services is higher (discussion of satisfaction in the next section), the quality of District Hospital combined with the slightly higher patient cost

should strengthen the reason to support the argument in favour of District Hospital for severe cases.

3.3 Satisfaction of the People

The perceived satisfaction of the people towards different health care service points did not measured in this study because of limitation of time and available resources. However, the perceived satisfaction of the people towards different health care service points had been studied and measured by Begum in Bangladesh in 1995. In her study satisfaction of the urban and rural patients (respondents) measured, towards the services/activities of District Hospital and as well as Thana Health Complex.

Urban respondents have no idea about thana health complex but they are satisfied about most of the services and activities of the district hospital.

On the other hand rural respondents are much more satisfied about almost all the services of the District Hospital like doctors availability, doctors attention towards the patient, laboratory services, adequacy of laboratory facilities, drug satisfaction, nursing services, food quality, diet schedule and a bit less satisfied about the waiting time to see the doctor at District Hospital because of over crowding. But most of the respondents are not satisfied about the location of the district hospital because of it's longer distance from their home.

In her study it was also found that rural and urban respondents regardless of their education, occupation and income prefer district hospital though the patient incur a substantial amount of recurrent cost which was much more greater than the average provider cost in District Hospital.

Satisfaction of the rural people towards the district hospital was much more higher and on the contrary District Hospital provide in-patient as well as outpatient service with less cost of provider in comparison to Thana Health Complex. This was mainly because of it's maximum utilization and also may be District Hospital was more effective and efficient in their services.

In this situation the rural more severe diarrhoeal cases might be referred to the district hospital for health care service because the provider cost is much more lower there and may be efficient which was reflected from Begum's study about the satisfaction of the people for management of severe diarrhoeal cases.

In case of OPD services cost difference per visit in district hospital and in thana health complex was not so much. So it is advisable to avail the nearby health care or hospital OPD facility by the people as a quick preventive measure to avoid in-patient care which cost much for the management of the disease. In those cases people need not to go too far i.e., need not to travel too far from home and can get treatment or services at a lower cost of the consumer because they need not to incur too much travel cost and as well as at a lower cost of the service provider through increased utilization i.e., rural people should use Thana Health Complex and urban people to District Hospital.

Table 3.2.3 also shows that in the District Hospital total (provider + patient) cost per patient day at IPD was Tk 748. 81 of which provider cost (capital + recurrent) participation was 42.45 % and patient cost (recurrent only) was 57.58 %.

In the Thana Health Complex total (provider + patient) cost per patient day at IPD was Tk 810.47 of which provider cost (capital + recurrent) participation was 50.20 % and patient cost (recurrent only) was 49.80 % .

Total (provider +patient) cost/OPD visit at District Hospital was Tk 202.97 of which provider cost (capital + recurrent) participation was 26.48 % and patient was 73.52 % but at THC total cost/OPD visit was Tk 185.18 and of which provider participation was 34.19% and patient was 65.81 %.

For the management of severe cases in IPD total cost at District Hospital (Tk 748.81 per patient day) was cheaper than THC (Tk 810.47 per patient day). In case of OPD for the management of non-severe cases total cost/OPD visit at District Hospital was Tk 202.97 and higher than that of Thana Health complex and it was Tk 185.18 per OPD visit.

Conclusions and recommendations

The study shows that while THC's are the nearest facilities offering in and out patient treatment rural people prefer to utilize District Hospital which are very crowded. Although the Thana Health Complex are underutilized but the Government has to pay the salary of the staffs, drugs cost, administration cost, repair and maintenance cost of

medical equipment, vehicles and building in full which is a wastage to the Government (public Provider).

4.1 Conclusions

The average provider cost including capital cost for cost per patient day in IPD and cost/visit in OPD of District Hospital was lower than in Thana Health Complexes. In addition the average length of stay in District Hospital was more than the Thana Health Complex and this was may because of more severe cases go to the District Hospital and admitted in the IPD.

The cause of higher unit cost for an OPD visit and cost per patient day at IPD of Thana Health Complex than that of District Hospital because Thana Health Complex incurred higher capital and as well as some recurrent costs like salary cost of personnel for administration i.e., support service, electricity and others, for treating the patient and this was mainly because of under utilization of the Thana Health Complex. In Thana Health Complex in 1997 no diagnostic tests were done for the patients at OPD but in District Hospital some diagnostic tests were done for OPD patients. Till that in District Hospital cost/OPD visit was lower mainly because of it's maximum utilization and also District Hospital may be more efficient in their services.

Analysis of the results implies two alternative policy implications. First if we want to reduce the average cost in Thana Health Complex we must have to increase the utilization rate; i.e., more patients should be encouraged to seek treatment at Thana Health Complex. Secondly, people should be encouraged to seek more treatment in District Hospital (specially in IPD) and scale down capital in Thana Health Complex.

For OPD, we have to encourage people to seek treatment at the nearby facility that will increase the utilization rate at OPD of Thana Health Complex. Consequently, reduce the crowd at District Hospital in OPD .

In case of recurrent cost of provider for IPD patient cost/patient day at District Hospital was lower than Thana Health Complex this was may because of District Hospital more efficient in disease management. Begum's study measured the

satisfaction of the people towards the quality of services of the doctors and their expertise, nurses service, laboratory tests, quality of drugs provided, food services and others at different level of health care. And the peoples are satisfied with District Hospital. Rural peoples are dissatisfied with one point only the longer distance to the District Hospital. This expression of the people indirectly shows that District Hospital was much more efficient than Thana Health complex as well as Health Center at the union level. She did not measure the efficiency. But the main reason for lower cost at District Hospital in both departments were for it's maximum utilization.

Taking into consideration of patients' perspective, non-severe cases (OPD cases) should be encouraged to seek treatment in Thana Health Complex because of lower cost (22% lower). However, severe cases like IPD cases, District Hospital performed better and should be encouraged to provide services for at least two reasons. First, average provider cost is much lower (16% less of IPD compared to 8% less of OPD case). Second, though patient cost was higher for both IPD and OPD cases due to travel and food cost, it was only 7% higher in District Hospital than Thana Health Complex for IPD cases compared to 22% higher for OPD cases. Moreover, if taking into consideration that quality of District Hospital services is higher (discussion of satisfaction section), the quality of District Hospital combined with the slightly higher patient cost strengthens the argument in favour of District Hospital for severe cases.

4.2 Recommendations

According to the perceived satisfaction of the rural people towards District Hospital and Thana Health Complex as well as public expenditure in the rural health complex it is recommended to reduce the excessive pressure to District Hospital and to increase the utilization of Thana Health Complex by rural people and to reduce wastage of public resources, it is also advisable to improve the services like quality of drug, laboratory facility, food quality and service. And also improve/increase efficiency of the service providers specially doctors, nurses and also other related health care staffs and service providers presence in the institutions should be ensured so that the patients can meet them easily. Recently most of the Thana Health Complex have received almost full service providing staffs and equipment i.e., Government

diverted a considerable amount of resources for rural health care services and all of the health care service personnel are fully salaried with accommodation facilities for most of them with in the campus. So that rural peoples attitude could be changed towards the nearby health complexes and maximize utilization of scarce resources could be possible with the provision of improved health care services and increased efficiency of the service provider at rural level to maintain the equity to an extent.

There do not exist any effective referral system. Strict and effective referral system should be introduced and followed so that more severe cases could be referred from the rural facility to District Hospital for operation and management.

Alternatively user charge may be introduced primarily up to the district level only to recover the recurrent costs of materials which may reduce the over crowding of patients at district level to some extent and will increase the utilization of rural health care facilities at least for OPD services. This may enhance the prevention of the disease at an early stage and will reduce the wastage of public as well as individual resources for in-patient care.

Unfortunately there was not any concrete nation wide survey about the ability of the people and also willingness of the people to pay for health care services. A nation wide house hold survey should be undertaken to get vital information about the ability and willingness of the people to pay for health care services which will be very helpful for introduction of the user charges at an wider range.

4.3 Limitations

This study was conducted in a purposively selected district. For data collection time and available resources was a limiting factor and for that reason retrospective survey was made and a few estimations were done for data analysis. Because of retrospective survey some variables could not be studied as it should be. Appropriate information could be collected along with a prospective survey at least for 6 months, will enable to get more accurate results from the process of calculation of unit cost for the disease.

References

1. Bangladesh Bureau of Statistics, Bangladesh Health and Demographic Survey, 1997.
2. Begum, S. A. "Cost analysis of childhood diarrhoeal inpatients: A case Study of Narayangonj District Hospital, Bangladesh". Unpublished M. Sc. thesis, Department of Economics, Chulalongkorn University, 1995.
3. Carrin, G., and Evlo, K. A Methodology for the Calculation of Health Care Costs and Their Recovery. Geneva: World Health Organization, 1995.
4. Chotiwan, P., Hempisut, P., Kamolratanakul, P., Dhanamun, B., Tungcharoensathien, V., and Hiransuthikul, N., "Unit costs of laboratory tests at the outpatient department of Chulalongkorn Hospital", Chula Med J 1996 Oct; 40 (10): 801-13.
5. Creese, A. and Parker, D. Cost analysis in primary health care; A Training Manual for Programme Managers. Geneva: World Health Organization, 1994.
6. Dhanamun. B., Hempisut, P., Kamolratnakul, P., Chotiwan, P., Tungcharoensathien, V., and Hiransuthikul, N, "Unit costs of diagnostic imaging tests at the outpatient department of Chulalongkorn Hospital", Chula Med J 1996 Oct; 40 (10): 821-36.
7. Directorate of Health Services, Bangladesh; Health Information Report, 1993.
8. Economic Trends, Statistics Department, Bangladesh Bank, Monthly December, 1997.
9. International Center for Diarrhoeal Disease Research, Bangladesh; National Rehydration Program, 1979.
10. ICDDR, B (b), Annual Report, 1993.
11. ICDDR, B (c), Diarrhoeal Disease Research, 1994; pp. 188-189.
12. Ministry of Health and Family Welfare Report, March, 1997.
13. Phillips, M., Mills, A., and Dye, C. Guideline for Cost Effectiveness Analysis of Vector Control. PEEM Secretariat, Geneva: World Health Organization, 1993.
14. Phillips, M., Shepard, D., Lerman, S. J., and Cash, R. A. Estimating Cost for Cost-Effectiveness Analysis; Guidelines for Managers of Diarrhoeal Diseases Control Programmes. Geneva: World Health Organization, 1988. Program for Control of Diarrhoeal Diseases. Geneva: World Health Organization, 1992.
15. Progotir Pathey, UNICEF; Bangladesh Bureau of Statistics . January, 1996.
16. Shepard, Donald S., Hodgkin, D., and Anthony, Y. Analysis of Hospital Costs: A Manual for Managers. Institute for Health Policy, Heller School, Brandeis University, Waltham, USA, 15 April, 1997.
17. Statistical pocketbook, Bangladesh Bureau of Statistics, Government of Bangladesh, 1996.
18. The State of the World's Children, UNICEF; BBS, 1997.