

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

#### **3.1 Study Design**

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

#### **3.2 Data/Information Collection**

Data were collected from 1<sup>st</sup> to 21<sup>st</sup> February, 1998 through hospital records survey, 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 the information and data were collected through field visits are as follows:

a. Organogram of the District Hospital and Thana Health complex and information on infrastructures such as area of different departments/units in square feet for allocating the costs. Total area of the hospital as well as different unit's area including diarrhoea to calculate the average cost of the building for diarrhoea in 1997

b. Number and types of staffs working in the organizations with their monthly salary structure and benefits and also the staffs related with the patient services of diarrhoeal diseases in 1997 to calculate the recurrent cost for patient service

c. Electricity, Water and Telephone bill, Fuel and Maintenance costs of the vehicles in 1997 to calculate the amount of costs for diarrhoeal patient service

d. Total number of OPD patients or total number of OPD visits and total number of patients in IPD with average number of days stay in the IPD of District Hospital and Thana Health Complex. From those number of diarrhoeal patients in OPD and IPD with average number of days stay in IPD in 1997 collected for proportionate allocation of the annual costs to diarrhoeal IPD and OPD

e. Total number of routine laboratory tests for all diseases for IPD and OPD at DH and THC, number of routine laboratory tests for diarrhoeal IPD and OPD in 1997 to calculate the total cost and average cost of tests for laboratory materials and then to calculate laboratory material costs for diarrhoeal IPD and OPD

f. Total material cost including laboratory tests and drugs for OPD and IPD of diarrhoea in 1997 to calculate average material cost (including tests and drugs) per OPD visit and IPD per patient day, and also food cost for IPD per patient day

g. Time spent/routine test by related staffs like Laboratory Technician, Pathologists in 1997 to calculate their salary cost for diarrhoea

h. Information on activities of the staffs to calculate cost of time spent for activities i.e., Doctor's time spent/patient for consultation, Laboratory Technician and Pathologist's time spent/laboratory test and also other related staffs like Pharmacist, Nurse, Orderly/MLSS to diarrhoeal patient service in 1997 to calculate the salary cost for diarrhoeal patient service in 1997

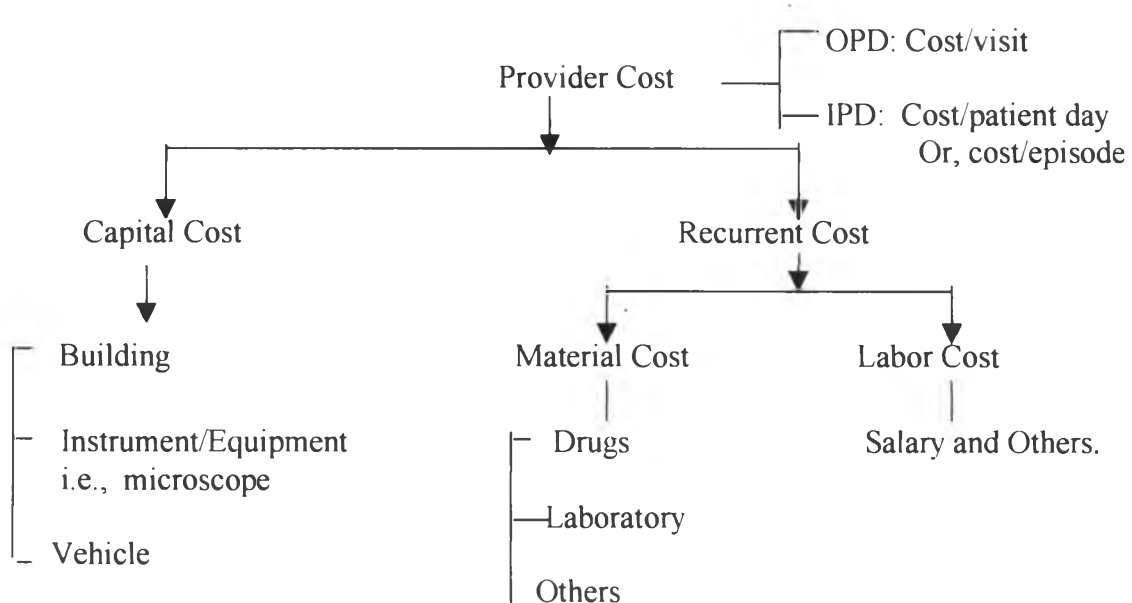
i. Responsibility or duty of the different category of staffs for direct and indirect services, working hour per day of the staffs to calculate per hour salary cost of each related staffs for diarrhoeal patient service in 1997

j. 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.

### 3.3 Conceptual Framework of Costing (Provider)

This study proposed to calculate the cost/visit in OPD and cost per patient day in IPD at District Hospital and Thana Health Complex in 1997 for the management of diarrhoeal disease and the conceptual framework of costing (provider) shown below in Figure 3.1.

**Figure 3.1** The Different Cost Components Incurred by the Provider for Hospital Care and Services.



Here concentrated to the provider cost when the patients treated at the hospital and wanted to know the unit cost of the provider for the management of diarrhoeal patients at district and rural level. This information will be helpful for patient service planning for efficient and effective management of the disease along with best utilization of scarce public as well as individual resources at different level.

### 3.4 Data Analysis

#### 3.4.1 Cost Classification:

Costs by inputs are classified here into two groups:

Capital costs-are those cost items that lasts longer than one year, including buildings, equipment, vehicles etc.

Recurrent costs- are those cost items 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).

Recurrent and capital costs also includes-

Patient service costs: these cost centers are responsible for direct patient services. Patient services divided into two departments- outpatient and in-patient departments.

Intermediate costs: these costs are responsible for auxiliary services to patient service. Intermediate cost consists of laboratory, pharmacy, and radiology (Shepard *et al*, 1997). But diarrhoeal patients are not usually related to radiology without other diseases/complications.

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 the salary of administration to IPD and OPD of diarrhoea, salary cost of personnel directly related to diarrhoeal patient services , ETW and FM cost, drug cost, laboratory cost and others.

### 3.4.2 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. 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:**

$$AC_k = \{C_{t_0} (1+r)^{1997-t_0} - S_n / (1+r)^{n-1997}\} / n$$

where,

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

$C_{t_0}$  = 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;

$t_0$  = Purchase / making year ;

$S_n$  = Scrap value at the end of life of capital item (n years) which has scrap value;

$n$  = Life 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 year =  $1,200,000 * 0.05 = 60,000$  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

$$AC_k = \{C_{t_0} (1+r)^{1997-t_0}\} / n$$

where,

$AC_k$  = Average annual cost of the capital cost item/asset at 1997 price ;

$C_{t_0}$  = 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;

$t_0$  = Purchase / making year ;

$n$  = Life of the capital item.

It is noted that in 1997 US\$ 1 equal to Tk 47.00 .

Average annual capital cost calculation of capital cost items are summarized in Table 3.1 (Detailed in Appendices C and D in Tables C.2, C.6, D.2 and D.6).

**Table 3.1** 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
<b><i>Reallocated Capital Cost of Administration</i></b>	<b><i>25,313.03</i></b>	<b><i>19,739.52</i></b>	<b><i>12,715.70</i></b>	<b><i>22,038.70</i></b>
<b>Total</b>	<b>352,615.65</b>	<b>90,467.30</b>	<b>164,177.10</b>	<b>92,799.40</b>

Sources : Tables C.6 and D.6 of Appendices C and D respectively.

### 3.4.3 List of Variables:

Units of drug

Unit drug cost

Total drug cost

Average drug cost

Total laboratory cost

Average laboratory cost

Individual food cost

Total food cost

Length of stay by individual in hospital

Individual and total salary cost of personnel

Total Electricity, Telephone and Water, Fuel and Maintenance cost

In this study total and average cost of the provider are calculated. The total provider costs can be estimated as follows:

$$TC_{IPD} = DC + LC + FC + AUX_c$$

$$TC_{OPD} = DC + LC + AUX_c$$

where,

$TC_{IPD}$  = Total cost for In-patient Department

$TC_{OPD}$  = Total cost for Outpatient Department

DC = Drug Cost

LC = Laboratory Cost

FC = Food Cost

$AUX_c$  = Auxiliary cost (means here the cost of support services such as house keeping, pharmacy, food service, cleaning, ETW and FM etc. and all the services availed by IPD patients but OPD patients do not avail all support services).

Average Provider Cost = Total Provider Cost / Total number patients treated.

### 3.4.4 Variable Cost Calculation Method:

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 in 1997 and then multiplied by the total number of 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/Individual drug cost = Total drug cost for the year/total number of patients treated.

Total laboratory cost = Summation of all individual laboratory costs materials for the 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 (Details in Appendices C and D, Tables C.3, C.4, C.7, D.3, D.4 and D.7) and then allocated to diarrhoeal IPD and OPD following the allocation criteria described in the next section.

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 cost of personnel for patient service of diarrhoeal IPD and OPD calculated in the following way:

First of all per year salary cost of the personnel related to diarrhoeal patient service in 1997 collected from hospital records. Calculated total working hour/year/person (365 days in a year \* 8 hours work/person/day). Then calculated per hour salary cost of each person by dividing each person's total salary cost/year by total working hour/year.

Then total amount of time spent by each person for patient service 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. Then calculated total cost of time for each person by multiplying the total time spent by each person by his 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 (Details in Tables C.5, C.8, C.9, D.5, D.8 and D.9 of Appendices C and D).

Calculated annual recurrent cost of recurrent cost items of District Hospital and Thana Health Complex are summarized in Table 3.2 (Detailed in Appendix C in Tables C.3-C.5, C.7- C.10, and Appendix D in Tables D.3-D.5 and D.7-D.10).

**Table 3.2** 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
ETW and FM 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
<b>Total</b>	<b>413,141.20</b>	<b>213,024.90</b>	<b>158,091.20</b>	<b>167,690.30</b>

Sources : Tables C.11 and D.11.

The detail computations of capital cost and recurrent cost items of the District Hospital and Thana Health Complex showed in Appendix C, Tables C.2-C.5 and C.10 and Appendix D, Tables D.2-D.5 and D.10 respectively.

#### 3.4.5 Allocation Criteria for Annual Costs:

Allocation of calculated annual costs (both capital and recurrent) for 1997 were done to the OPD and IPD of diarrhoea by using appropriate allocation criteria (Appendices A and B, Appendix C, Tables C.6-C.9 and Appendix D, Tables D.6-D.9).

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 District Hospital was done by the following way:

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

Space for administration department = 2,873 sq. ft.

Administration department covers =  $(2,873 / 23,814) * 100 = 12.06 \%$  of hospital building area,

Similarly OPD covers =  $(4,289.25 / 23,814) * 100 = 18.01 \%$  of hospital building area;

IPD covers =  $(16,551.75 / 23,814) * 100 = 69.93 \%$  of building area;

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;

So diarrhoeal OPD covers =  $4,289.25 \text{ sq. ft} * 9.66\% = 4,289.25 \text{ sq. ft} * 0.0966 = 414.2 \text{ sq. ft}$  of the hospital building area and is =  $(414.2 / 23,814)*100 = 1.74 \%$  of hospital building area;

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;

In 1997 average annual building cost was 3,568,969.00 Tk;

**So, building cost allocated to administration department =  $3,568,969.00 \text{ Tk} * 12.06\% = 3,568,969.00 \text{ Tk} * 0.1206 = 430,417.70 \text{ Tk}$ ,**

**Building cost to diarrhoeal OPD =  $3,568,969.00 \text{ Tk} * 1.74\% = 62,100.06 \text{ Tk}$**

**Building cost to diarrhoeal IPD =  $3,568,969.00 \text{ Tk} * 8.35\% = 298,008.90 \text{ Tk}$**

Similarly capital costs of water pump machine and jeep allocated to the departments mentioned above; and

Then the cost of three capital items of administration (indirect cost for patient service or cost for support service ) also reallocated to patient service departments i. e., OPD and IPD of diarrhoea giving reasonable weights to patients at OPD and IPD by the following way:

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 (Appendix A);

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 diarrhoeal OPD was 5,647 and at IPD was 7227 ;

So diarrhoeal OPD covers  $= (5,647/132,740) * 100 = 4.25\%$  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 diarrhoeal 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 ETW and FM and salary of administration (support or auxiliary service cost) to diarrhoeal 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 diarrhoeal 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 diarrhoeal IPD on the basis of total inpatient days e.g., cook is only for IPD and diarrhoeal IPD patients covers 9.73% of total IPD patients (Appendix A) and for that reason cook's annual salary's 9.73% allocated to diarrhoeal 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 its 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 (Appendices A and B).

Also in the similar way allocation of the calculated average annual costs of capital cost items and recurrent costs were done to the diarrheal 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 (Appendices B and D, Tables D.6 - D.9 ).

Capital and recurrent costs are added together for both units in the District Hospital (Appendix C, Table C.11) and Thana Health Complex (Appendix D, Table D.11).

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.