CHAPTER III

RESEARCH METHODOLOGY

3.1 Study Design

The study is descriptive in nature. It mainly tried to analyze costs of dental care provided at study hospitals.. It calculated the total cost and unit or average cost of provider for dental care at Narsingdi District Hospital and Shibpur Thana Health Complex in Narsingdi district in Bangladesh. It tried to see who are using dental care services with what problems at study hospitals. A retrospective survey of hospital record was conducted for collecting information about cost items of outpatient (Dental OPD) service at both the hospitals. In addition to that this study reviewed countries position in respect to dental care policy, target, law and dental manpower situation.

3.2 Study Location

In District Hospitals and Thana Health Complexes in Bangladesh for dental care only OPD service is provided. The study is conducted in a District Hospital (DH) and Thana Health complex (THC) of a purposively selected district in Bangladesh. Study location was Narsingdi District Hospital and Shibpur Thana Health Complex of the same district. There are some basic facts of the district are presented in the following table with national statistics. So readers can see those to get a brief idea about the study location.

Table 3.1: Some Basic Facts of Narsingdi and National level

Indicators/Factors	National	Narsingdi
Population (Million)	122.8	1.83
Per capita income	254 US$	218 US$
Health status:		
➢ IMMR	77	79
➢ MMR	4.0	4.5
Percent of population use safe drinking water	96.5 %	95 %
Percent of population use sealed latrine	11.2 %	6.3%
Education	41.5 %	31.6%
Ratio of Male & Female	104	106
Ethnicity		
➢ Bangali	98.91 %	99.9%
➢ Others	1.09 %	0.1%
Distribution of non-firm & firm households		
➢ Non-farm	34 %	36 %
➢ Farm	66 %	64 %

Source: Bangladesh Health bulletin 1996(Published November 1998, Civil Surgeon Narsingdi ands Statistical Pocket Book 1998

It is also mentioned that, in Bangladesh district and thana are the two of the five administrative tiers/levels the of the country. Districts are consisted of two or more thanas. District Hospitals are situated in district headquarter which is known as *Sadar*(Headquarter) thana and Thana Health Complexes are situated in thana headquarter. There is no Thana Health Complex in *Sadar* Thanas, because District Hospitals are located there.(See Appendix G) Including *Sadar* and Shibpur thana there are six thanas in Narsingdi District and except Shibpur THC there are five THC located in five other thana headquarters.

3.3 Conceptual Framework for Total Costs

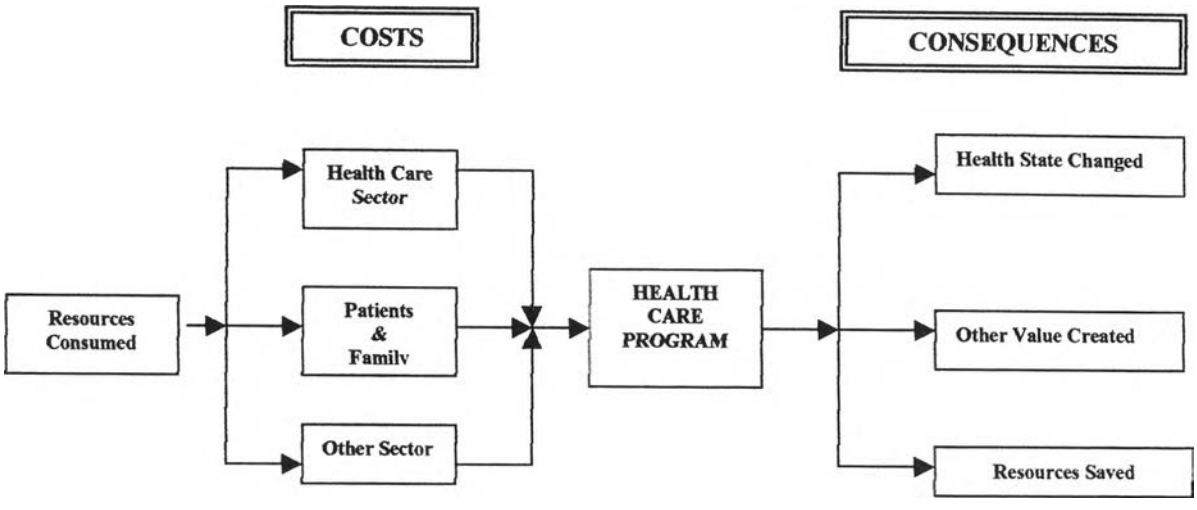
There are two different ways to analyze the cost of activities undertaken by an intervention: using financial costs and using economic costs. Financial costs are a useful first step to deriving economic costs and also provide an in depth understanding of money flows and who pays (Philips, Mills and Dye, 1993). In many situations, economic costs and financial costs are equivalent. Use of financial costs as a starting-point for estimating economic costs; then the following three features and make adjustment if necessary:

- *Donated goods or services:* These should be valued and included in economic costs.
- *Distorted prices:* Cheek whether salaries/ prices and the official exchange rate are valid measures of the value of labor, material and foreign exchange, respectively.
- *Capital:* Instead of using expenditure and depreciation, calculate the annualized value of capital items being employed, using an appropriate discount rate.

(Creese and Parker, 1994)

Following categories of costs and consequences are relevant to an economic evaluation of health services and programs (Figure - 3.1).

Figure 3.1:Total Costs and Consequences of a Health Intervention/ Health Care Service



(Partially adopted from Drummond et al, 1998)

Health Care Sector Resources consumed are consisting of the costs of organizing and operating the service or program (i.e. capital, labor and material etc.).

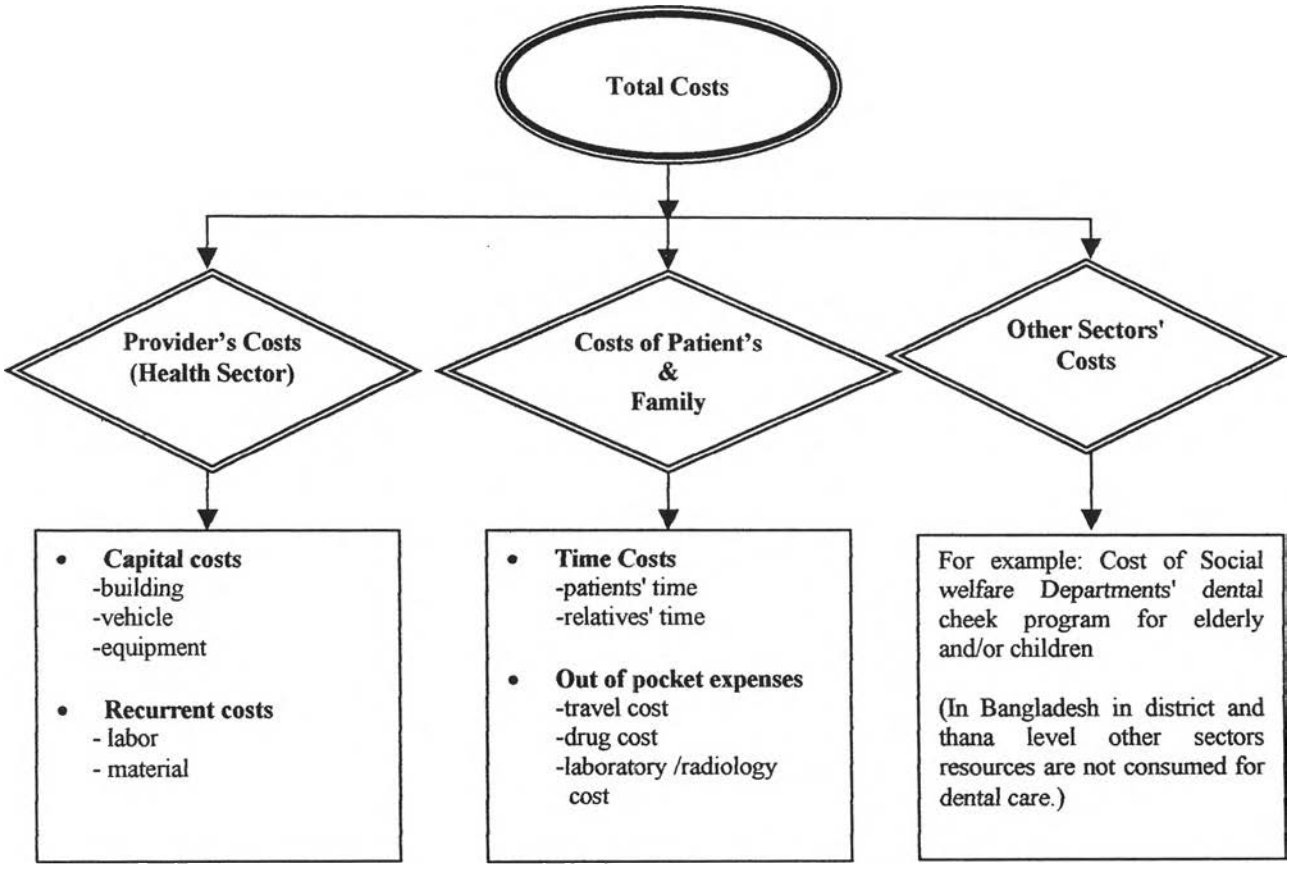
Patients and Family Resources consumed include any out of pocket expenses incurred by patients and/or family members as well as the value of resources they contributed to the treatment process. This would include patients' time and relatives' time costs.

Other Sectors' Resources. In some health care programs or services resources consumed in other sectors e.g. in Bangladesh the elderly care program consumed resources in social welfare sector. But in Bangladesh in district and thana level other sectors resources are not consumed for dental care.

(Modified from Drummond et al, 1998)

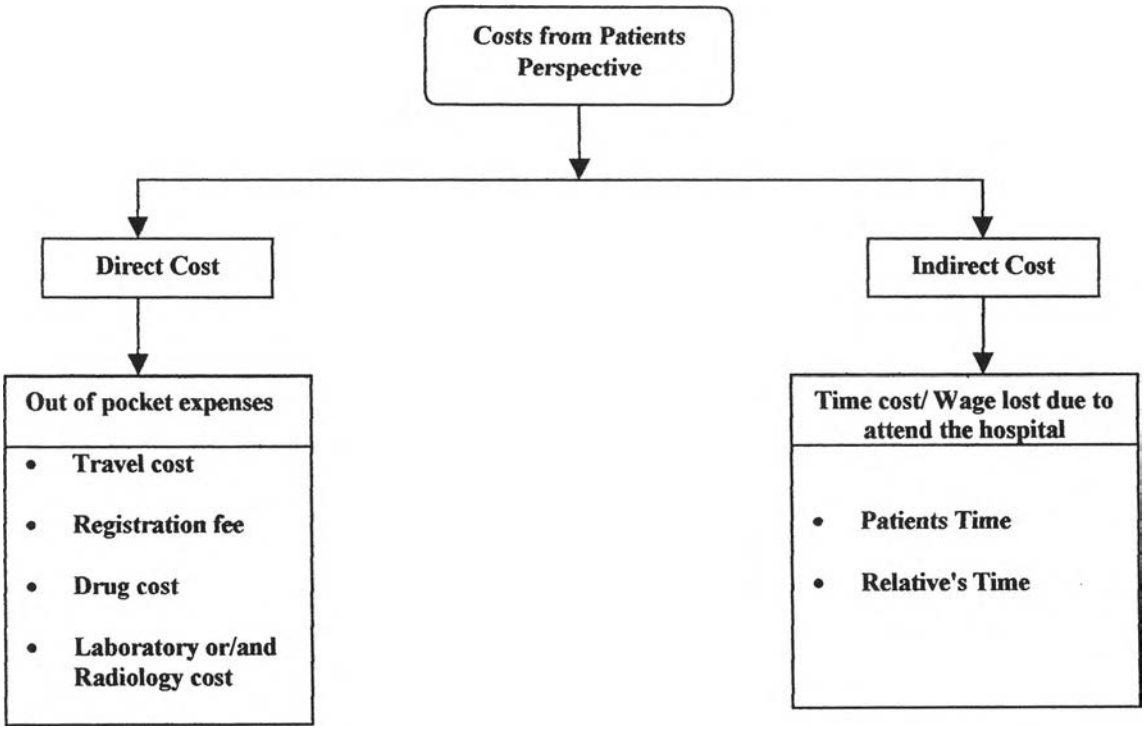
The components of total costs for dental care service at District Hospitals and Thana Health Complex in Bangladesh are shown in the following figure(Figure 3.2).

Figure 3.2:Components of Total Costs for Dental Care service



In Bangladesh at District Hospitals and Thana Health Complexes except nominal registration fee and rent for paying beds (very limited number) health cares services is al most free of cost. But these public sector hospitals are always suffered from chronic scarcity of resources. In most of the cases households have to pay for drug (for buying from market), diagnostic tests (from private settings), and other accessories transportation and of their wages. The following figure shows the cost component of patient's side for providing dental care at DH and THC.

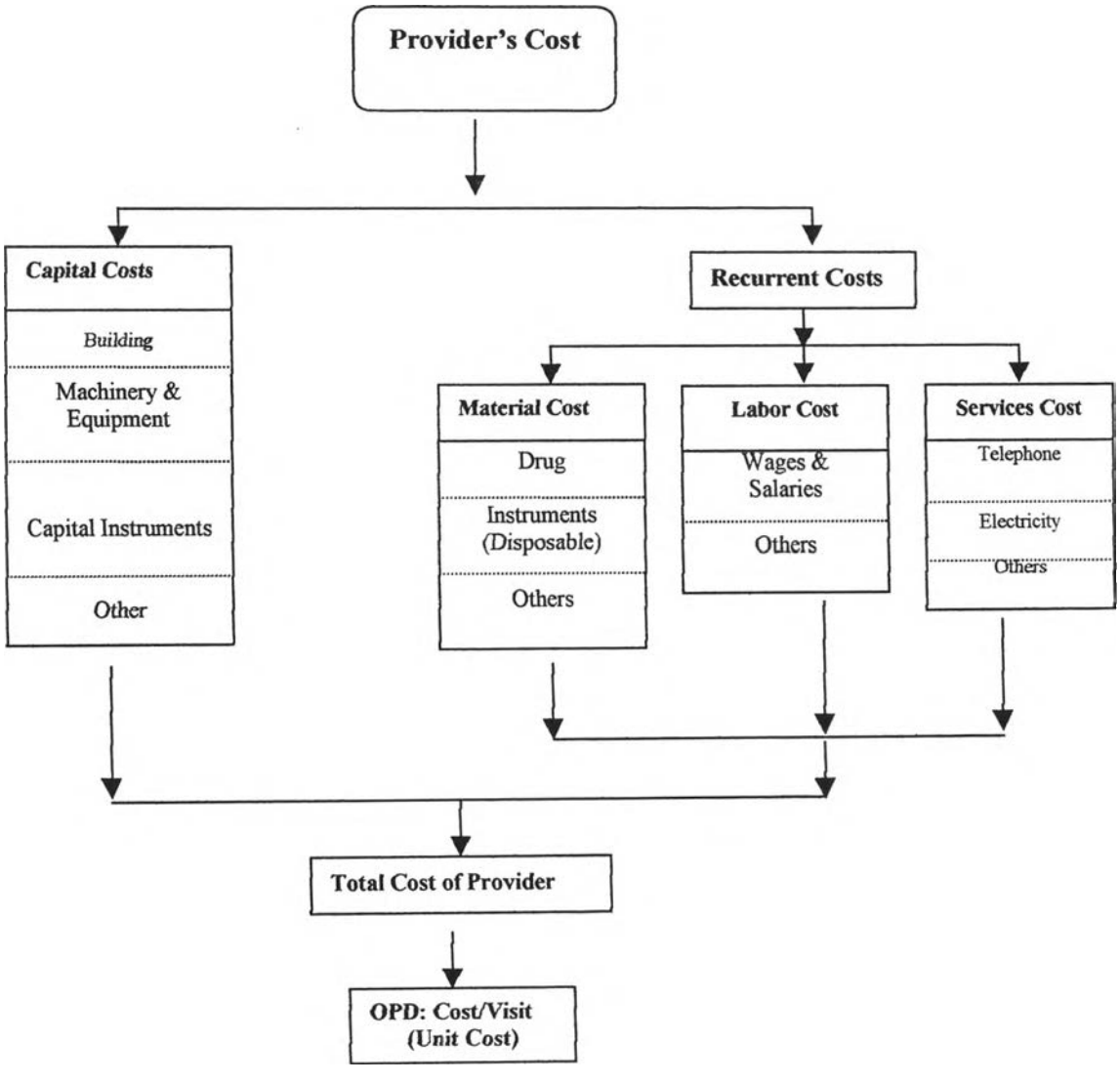
Figure 3.3 Cost for Dental Care at District Hospital and Thana Health Complex (Patient's perspective)



3.3.1 Conceptual Framework for Cost of Dental Care (Providers perspective)

In above the framework for total cost is drawn, reviewed and explained. This study is proposed to calculate and analyze the total costs both capital costs and recurrent costs of provider for providing dental care in OPD (out patient department) in1998 at the study hospitals. The framework for costing (provider) is shown bellow in Figure -3.4.and this study has followed this framework.

Figure 3.4: Different Cost Component Incurred by the Provider's for Dental Care at DH & THC



3.3.2 Calculation of Unit Cost

In District Hospitals and Thana Health complexes only out patients services are provided. So at first it is considered relevant to know on an average how much costs the provider is incurring for one visit. Patients usually comes with different dental problems, these are dental caries, periodontal diseases (*gingivirtis, periodntitis, tooth abscess*), delayed or painful eruption of tooth, delayed fall of decidual teeth and the treatments provided to them are, medication, extraction, fillings (permanent and temporary), scaling/gum-treatment, operculactomy (minor surgery) (explained in Appendix F). In one visit mostly one treatment is provided. These treatments need different quality, types, and quantities of medicine and also different volume labor hour, especially the direct inputs. So the costs per visit will be different for different visits. So, the calculation of average cost or unit cost of each of the service/treatment needs detail data about inputs for each of services.

So the following worksheet is adopted for identifying, measuring and valuing costs:

Table 3.2: Identifying, Measurement and Valuation of Costs

Resources used	How to measure	Basis for valuation
Capital	Unit/amount consumed	Price (annualized)
Labor Costs: Direct labor Indirect labor	Time (hours)	Salary/Wage rate
Material: Drug Disposable equipment	Unit/amount consumed.	Price
Overhead	Unit/amount consumed. Time (hours)	Price

(Partially adopted from Oxford Text Book of Public Health 1997).

3.4 View Point of the Cost Analysis

Though this study has reviewed the total cost of intervention and drawn the framework for the total cost of dental care service but it is mainly concentrated on analysis of the cost to the provider's perspective due to time and resource constrain and difficulty in obtaining all relevant data needed to consider societal perspectives with in the time frame.

3.5. Data /Information Collection

Two persons were employed to collect data at two settings i.e. Narsingdi District Hospital and Shibpur Tahna Health Complex and an experienced person with economics background supervised them. Necessary information/data were collected in February and March 2000 through hospital record survey, observation and discussion with hospital authority and district health authority and relevant persons (e.g. dentists). The study was mainly based on secondary data. To study and analyze the cost of treatment of dental patients and utilization of dental care in out patient department of both hospitals information and data were collected.

3.6 Data Analysis

3.6.1 Cost Assignment

First the cost centers related to dental care service are identified. In DH and THC there except the dental department services of the administration department, housekeeping pharmacy/drug store are also utilized by the dental department and the dental patients. So the costs of those department also assigned to the dental department (Detailed in Appendix C Table C.1 and Appendix D Table D.1).

3.6.2 Cost Classification

Classification of cost by inputs is useful and widely acceptable way of classification. Costs by inputs are classified unto groups: Capital costs and Recurrent costs.

Capital costs: Goods with a useful life greater than one year or in other wards or cost items that lasts longer than one year. It usually includes:

- Building
- Equipment
- Vehicles etc.

Recurrent costs: Those goods or services are purchased, used or replaced with in period of year and usually purchased regularly. It is the cost operating an enterprise or service or program and also called operating costs. Typically they includes the costs of:

- Materials/ supplies (such as drug, disposable instruments etc.)
- Personnel (i.e. manpower/ labor)
- Operating costs of:
  - Building
  - Vehicles
  - Equipment
- Other operating expenditures not included in above

(Adopted with modification from Creese and Parker 1994 and Philips, Mills and Dye 1993)

3.6.3 Calculation of Capital Cost

The annual economic value is based on (i) replacement cost of the capital item (its price in the year for which cost are measured i.e. 1998), (ii) its expected useful life and (iii) the opportunity costs of tying up money in capital goods (as reflected by the interest or discount rate). From the discount or interest rate and length of life the annualization factor is identified. The replacement price is divided by the annualization to get the annual cost for 1998. To calculate the average annual costs of all capital inputs the following formula is used:

$$ {}^{A}C_{k} = \frac{C_{t_0}(1 + r)^{t_s - t_0}}{A_f} $$

Where,

$^{A}C_k$ = Average annual cost of capital.

C_{to} = The purchase value or installation cost of capital goods

t_0 = Year of purchase or installation of capital goods.

r = Interest rate in 1998 (in this study it is 14% i.e. Interest rate of the central bank of Bangladesh , Source: Bangladesh Bank, the central of Bangladesh)

t_s = Year of study i.e. 1998

n = Life of the capital item.

A_f =Annualization factor

In this study capital cost items are as follows:

- Common or shared items: These items of capital cost are common to different departments or activities.
  - Hospital Building
  - Vehicles
  - Water Pump Machine

- Direct items: These items are direct cost items of dental department and not attributable to other department.
  - Dental unit (chair + light + spittoon +compressor etc)
  - Examination sets(dental probe, dental mirror, twizen etc)
  - Dental cartridge shirring
  - Forceps
  - Hand pieces

By using the above formula, the annual capital cost of building is calculated as follows:

The cost of Narsingdi DH building in the year of built (C_{to}) = 18,000,000 Taka

Year of built (t_0) = 1981.

Study period (t_s) = 1998.

Interest rate (r) in 1998 = 14%.

Lifetime (n) = 30 years.

Annualization factor (A_f) obtained from the table = 7.003

$$= \frac{18000000(1 + 0.14)^{1998 - 1981}}{7.003}$$

$$^{A}C_k = \frac{C_{1981}(1 + r)^{1998 - 1981}}{A_f}$$

So, annual cost of hospital building equal to,

= 23,843,546.41 Taka.

The other capital cost of capital cost items of District Hospital and Thana Health Complex is also calculated in similar way. Then direct capital costs are directly assigned to the department concern and shared capital costs are allocated on the basis of appropriate allocation criteria.(The calculations of total annual capital costs of capital items are summarized in the Table 4.1.and detailed in Appendices C and D in Tables C.1, 2, 3 and D.1, 2, 3.)

3.6.4 Calculation of Recurrent costs

3.6.4.1 Costs of recurrent inputs/items are mainly two types

3.6.4.1.1 Direct Recurrent costs:

Direct personnel cost of Dental Department is comprised of the salary of dental surgeon, medical technologist (dental), MLSS (Member of Lower Subordinate services- non-technical person) in the year 1998.

Direct materials are drug, disposable equipment (needle & other surgical items), filling material (both temporary and permanent), elevator, bar, laundry. The value/price of these materials allocated to and used in 1998 by the dental department and dental patients are obtained from the hospital record.

3.6.4.1.2 Overhead and/or shared cost item

Overhead or shared cost items include personnel costs of administration, personnel costs of pharmacy, electricity, water, telephone, and fuel & maintenance of vehicle incurred in the 1998.

3.6.4.2 Calculation method:

Data on different recurrent cost items are collected from hospital record. The recurrent cost items are as follows:

-Direct labor cost i.e. salary of dental department staffs i.e. those who working in the department

-Indirect labor costs includes salary of administration, housekeeping (i.e. salary of sweepers, guards and gardener) and pharmacy

-Material (Medicine, Disposable Equipment & others)

-Electricity & Water

-Telephone

-Fuel and maintenance of vehicle

The monthly salary the personnel directly working in the dental department and indirectly related to this department are collected from the pay register. Monthly salary includes basic salary plus medical allowance & house rent allowance. The monthly salaries of personnel are multiplied the by 12 and then added to festival bonus to get total yearly salary (Detailed in Appendices C and D Table C.7 and D.7).

In the same way the total salary of administration, housekeeping and pharmacy is calculated. (Detailed in Appendices C and D Table C.4, 5, 6, and D.4, 5, 6,)

The price of drug and other materials, which were disbursed to the dental department and dental patients, are collected from the register of pharmacy/drug store and other hospital record. The actual cost of laundry is also obtained from hospital record (Detailed in Appendices C and D Table C.9 and D.9).

Total electricity & water, telephone, and fuel & maintenance costs of the year 1998 obtained and then the costs are allocated to dental other department according to allocation criteria. It should note that there was no separate cost for water because under ground water was lifted through pump machine. So, the costs for water was included in electricity bill (Detailed in Appendices C and D Table C.10, 11 and D.10, 11).

Calculated annual recurrent costs of recurrent cost items of District Hospital and Thana Health Complex are summarized in Table 4.2.(Detailed in Appendix C in Table C.7, 8, 9 10 & 11 and in Appendix D in Table D.7, 8, 9 10 & 11).

3.6.5 Cost Allocation

Both annual recurrent and capital costs for the year 1998.are allocated by using appropriate criteria on the basis of available data. The cost allocation criteria are explained bellow and detail calculation of allocation basis is shown in Appendices A and B.

Building: To allocate the capital costs of building to different departments/activity, the space or area of departments is used as allocation basis. For example the annual capital cost of building is allocated to the administration department on the basis of proportion or percentage of the floor area occupied by this department. Which is shown in bellow.

$$\text{Percentage of Administration Department Space} = \frac{\text{Administration Department Space}}{\text{Total Space of the Building}} \times 100$$

$$\text{Allocated Building Cost to Administration Department} = \text{Building Cost} \times \text{Percentage of Administration Department's Space}$$

In the same way building cost allocated to pharmacy. But no space was allocated to housekeeping because there is no separate housekeeping department exists, the housekeeping staff's just work under supervision of general administration. For calculating percentage of dental department's space the allocated waiting space for out-patients is also added to dental department space. Which is as follows:

$$\text{Percentage of Dental Department Space} = \frac{\text{Direct Space of Dental Department + Allocated Waiting Space}}{\text{Total Space of the Building}} \times 100$$

Allocated Building Cost to Dental Department Space = Building Cost X Percentage of Dental Department's Space

***Waiting Space*:** Waiting space of the hospitals shown in this study (Appendices C & D) is the waiting space of out patients. Which is directly assigned to OPDs only. Waiting space is allocated to OPD dental on the basis of the percentage of total dental patients to the total out patients, which is shown as follows:

$$\text{Percentage of Dental Patients to Total Out-patients} = \frac{\text{Total OPD Dental Patients in 1998}}{\text{Total OPD Patients in 1998}} \times 100$$

Allocated Waiting Space to Dental Department = Total Waiting Space X Percentage of Dental Patients to Total Out-patients

The waiting space of the pharmacy is included in total pharmacy space of both the hospitals i.e. pharmacy space shown (Appendices C & D) in this study is the total pharmacy space including waiting space of the pharmacy.

Water Pump Machine: Allocated on the basis of the space occupied by departments. Same as building cost.

Jeep: Jeep is exclusively used by the hospital administrator of the district hospital i.e. whole time it served administration department. So the first the 100% cost of Jeep is assigned to the administration department and then reallocated to other departments same as the other costs of administration allocated to them.

***Administration Department Costs*:** The salary of the hospital administrator and his support staffs are usually allocated to other departments on the basis of the time that they spent for each of the departments and this information usually collected through interview with administrator. But in this case this information could not be collected. So here the costs of administration department are allocated to other department on the basis

number or the proportion of the department's to remaining total staff (Total staff - Administration staff).

For example to allocate administration department to pharmacy the following formula is used.

$$\text{Allocated Admin. Cost to Pharmacy} = \text{Admin. Department Cost} \times \frac{\text{Total Pharmacy Staff}}{\text{Total Staff - Administration Staff}}$$

So, same as above, the cost of administration department is allocated to dental department and housekeeping.

***Housekeeping (Cleaning, Security and Mali (Gardener))*:** Allocated to different departments/ cost centers on the basis of space or area occupied by different departments.

***Pharmacy*:** Cost of pharmacy is usually allocated to final patients service department on the basis of number of prescription they send to the pharmacy or the utilization of pharmacy service or estimates by employees. But in this case detail information were not available and also not possible to estimates by employees. So the costs of pharmacy (both capital and recurrent) are allocated on the basis of the volume of service provided to final service departments. Here it is assumed that one out-patient visit equal to one in-patient day. So, total volume of served by final service departments = Total out-patient visits + Total in-patient days. So, in the following way the pharmacy cost is allocated to dental department.

$$\text{Proportion of Volume Served (V/S) by Dental Department} = \frac{\text{Total Volume Served by Dental Department}}{\text{Total Volume Served by Final Patients' Service Departments}} \times 100$$

$$= \frac{\text{Total Dental Patient Visits in 1998}}{\text{Total Out-patients Visits in 1998 + Total In-Patients Day in 1998}} \times 100$$

$$\text{Allocated Cost of Pharmacy to Dental Department} = \text{Cost of Pharmacy} \times \text{Proportion of V/S by Dental Department}$$

***Electricity & Water*:** Allocated to departments on the basis of space or area occupied by different departments. Same as cost of housekeeping or building allocated.

Telephone: In both hospitals there is no telephone in the dental department. Telephone bills shown here are the bills of telephones of hospital administrators of both the hospitals. So, at first the telephone cost is assigned 100% to the administration department and then reallocated to other departments same as the other costs of administration allocated to them.

Fuel & Maintenance of Jeep: It is mentioned earlier that Jeep is exclusively used by the hospital administrator of the district hospital i.e. whole time it served administration department. So same as cost of Jeep the cost fuel & maintenance (FM) of Jeep first the cost is assigned to the administration department and then reallocated to other departments same as the other costs of administration allocated to them.

Table 3.3: Summary of Allocation Basis

Cost Item	Allocation Basis
Building	Percentage of Total Space
Waiting Space (OPD)**	Percentage of OPD Patients
Jeep	% of Use or Served
Water Pump Machine	Percentage of Total Space
Housekeeping (Cleaning, Security and Gardening)	Percentage of Total Space
Administration:	Number or Proportion of Personnel
Pharmacy:	Proportion of Volume Served (V/S)
Electricity & Water	Percentage of Total Space
Telephone	Proportion of the Use
Fuel & Maintenance of Jeep	% of Use of Jeep

[Note: Detail calculation of allocation basis is shown in appendices A & B and detailed about calculation of shared/ common costs are shown in Appendices C, D, & E. **Space allocated].