ORIGINAL RESEARCH PAPER

Volume - 12 | Issue - 06 | June - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COSTING OF CENTRAL STERILE SUPPLY DEPARTMENT (CSSD) BASED ON SURGICAL BEDS IN A TERTIARY CARE TEACHING GOVERNMENT HOSPITAL

Hospital Administration

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ABSTRACT

Background – Hospital acquired infections (HAIs) have a negative impact on both patients and hospitals. The Central Sterile Services Department (CSSD) is responsible for providing sterilised medical devices for clinical procedures. CSSD is an essential in-house service for patient care, and it serves as a significant indirect cost centre for hospitals. **Methodology–** This study analysed the cost of operations in the CSSD of a Tertiary Care Teaching Government Hospital in Lucknow, India using the absorption costing method. **Results–** The total operating cost of CSSD was ₹ 13,09,445.98/month, with 43% of the cost being borne by manpower, 22% on electricity and water, 20% on consumables, 12% on machines, and 3% on building. The average cost of CSSD for surgical beds was found to be ₹ 68.52/day. **Conclusion-** The study's results can aid hospital administration in decision-making, process redesigning, and allocation of the hospital budget for CSSD operations.

KEYWORDS

CSSD, HAI, cost

1. INTRODUCTION

Hospitals must prevent infections to protect patients and staff. Hospital-acquired infections (HAI) have many negative impacts, including longer patient stays, higher morbidity and mortality rates, increased antibiotic use, and higher costs for patients and care providers. The Central Sterile Supply Department (CSSD) plays a critical role in maintaining high-quality health services and reducing HAI. [1,3]

CSSD aims to provide safe, reprocessed medical devices for clinical procedures to improve patient safety and reduce hospital infection rates. [2]CSSD is a crucial cost centre in hospitals. Sterilization in CSSD is done under supervision and at an optimal cost. [3]

Poor costing system hurts pricing, sustainability, and service quality. Hospitals need to understand costs to improve pricing, processes, and outcomes. Without this understanding, one cannot make sustainable cost reductions or improve CSSD services. [4]

The purpose of this research is therefore to serve as a starting point for providing better decision support. Cost analysis and accounting of CSSD will also provide the essential information to the hospital administrators to ensure the optimal utilization of expensive items and manpower and to identify any outsourcing opportunity of CSSD.

2. MATERIALS AND METHODS

The study was conducted in CSSD of a tertiary care teaching government hospital in Lucknow India. It was an observational, descriptive study and cost is calculated using the absorption costing method for a period of 12 months.

Inclusion Criteria:

The study was conducted at following CSSDs:

a. CSSD in Shatabdi Phase I
b. CSSD in Trauma Centre
c. CSSD in Lari (CTVS)
d. CSSD in Queen Mary's Hospital
e. CSSD in General Surgery Department

Exclusion Criteria:

Sterilization process done in OPD/Wards/ICUs/OTs/Labs

Parameters:

A. All the expenses done in CSSD in study period were recorded in following cost heads:

i) Building Cost
ii) Cleaning Cost
iii) Manpower Cost
- Pay credited to employee as gross monthly salary.
- In case the employee is shared between two departments then the salary for average hours spend by the employee in CSSD is taken.

iv) Machine Cost
- Maintenance Cost
- Depreciation Cost - It is calculated by using Constant Percentage method (Declining Balance Method).

v) Electricity Cost
- Per Unit Cost
- Power Factor
- Load/equipment (kW)
- Average load (kW)
- Load (kVA)
- Running Hours/month
- Cost/month

vi) Water Cost
- Water Tax
- Sewer Tax

vii) Consumable Cost - The indents made during the study period for the consumables were analysed and cost per unit and applicable GST rates were taken into consideration.

B. Following Costs were calculated:

I) Operational Cost of each CSSD/month.
ii) Total Cost incurred in Sterilization process in all CSSD/month.
iii) Sterilization Cost of each CSSD (per bed per day).

Data collection:

After obtaining clearance from the ethical committee the data was collected by an observational checklist and records maintained in Administrative Area.

Data analysis:

Data was recorded and details were filled in MS Excel and MS word and analysed.

3. Observations:

On observation it was found five CSSDs are present in different buildings of the hospital complex to cater to the demand for sterile

 PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

functions throughout the hospital.

Table 1: Number of beds catered by CSSD

CSSD	No. of Surgical beds
Shatabdi Phase I	550
Trauma Centre	475
Queen Mary's	342
Lari (CTVS)	66
General Surgery	310

Elucidation of various cost heads:

Absorption costing is used to analyse all costs for accounting purposes. Cost heads are identified and all expenses related to sterilization in CSSD are categorized under these heads:

Figure 1: Cost Heads

Building Cost

Cost of the land is not considered as it's a government building.

Building Maintenance Cost

The area of the CSSD is physically measured by measuring tape. The CSSD's total area is 322.86 sq. mt. and valued at ₹55,000/sq. mt. as per circle rate issued by the Government of Uttar Pradesh for Qaiserbagh to Chowk area. [5]

The maintenance cost of all CSSD is estimated at 2.5% of the total building cost as per UPPWD [6], resulting in a cost of ₹ **36,994/month.**

Table 2: Building Maintenance Cost

CSSD	Area (sq. mt.)	Circle Rate per sq. mt.	Land Cost	Annual Maintenance cost (2.5%)	Monthly Cost
Shatabdi Phase 1	152.86	₹ 55,000	₹84,07,454	₹2,10,186	₹ 17,516
Trauma Centre	57.9	₹ 55,000	₹ 31,84,500	₹ 79,613	₹ 6,634
Queen Mary	29.4	₹55,000	₹ 16,17,000	₹ 40,425	₹ 3,369
Lari Hospital	24.39	₹55,000	₹13,41,648	₹ 33,541	₹ 2,795
General Surgery	58.30	₹ 55,000	₹32,06,500	₹ 80,163	₹ 6,680
Total	322.86		1,77,57,102	₹ 4,43,928	₹ 36,994

Cleaning Cost

CSSD in Shatabdi Phase 1 and Trauma Centre is cleaned by outsource agency at a cost of ₹ **6,809.18/month**. While CSSD in Queen Mary's, Lari Hospital and General Surgery is cleaned by internal staff and the cost for cleaning these areas includes the manpower cost (housekeeping staff) and cleaning material cost which is mentioned in further cost heads:

Table 3: CSSD Cleaning Cost

CSSD	Surface Area (sq. mt.)	Tender Rate (per sq. mt.)	Effective Cost
Shatabdi Phase I	152.86	₹ 32.4	₹ 4,933.22
Trauma Centre	57.9	₹ 32.4	₹ 1,875.96

Human Resource Cost

CSSD staff salaries are calculated by approximate hours spent, while gross monthly salary determines the pay of other staff. The cost of HR in the CSSD department is ₹ **5,55,146/month.**

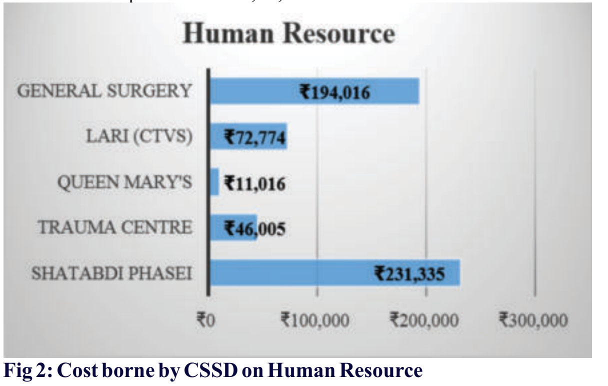

Fig 2: Cost borne by CSSD on Human Resource

Equipment Maintenance Cost

During the study period, it was observed that equipment under warranty were periodically serviced by the seller, while old equipment not in warranty were only serviced and repaired when any breakdown occurred. No repair expenditures were incurred during the study period.

Equipment Depreciation Cost

Depreciation cost for equipment in CSSD is calculated using the Declining Balance Method with a depreciation rate of 15% as per the GOI Income Tax Rules. The calculated monthly depreciation cost for all equipment in CSSD is ₹**1,56,435.48.** [7]

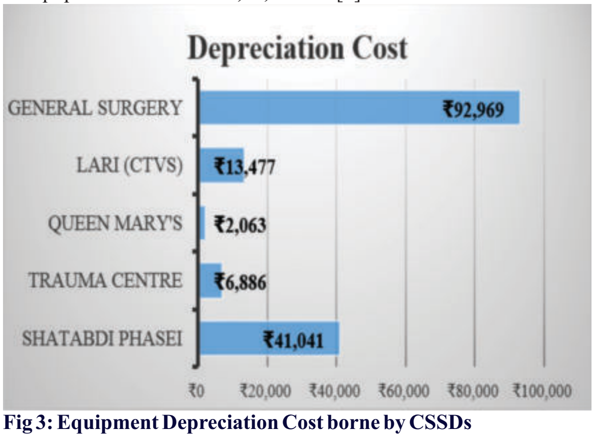

Fig 3: Equipment Depreciation Cost borne by CSSDs

Electricity Cost

Based on calculations, cost of electricity for a month for all CSSDs is **₹2,91,441.12.**

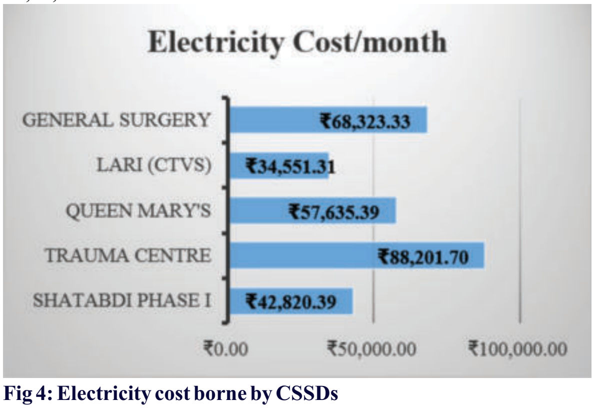

Fig 4: Electricity cost borne by CSSDs

Water Cost

Hospital pays annual water and sewer taxes as per UP Govt. norms. Monthly taxes of ₹462.41 & ₹110.98 are apportioned based on ratio of CSSD surface area to total building surface area, as groundwater is the only water source for CSSD.

Fig 5: Monthly water and sewer tax borne by CSSDs

Consumable Cost

The indents of the consumables, cost per unit and applicable GST rates were analysed and monthly cost of consumables used for sterilization in CSSD is calculated, which comes out to be **₹2,62,054.4/month.**

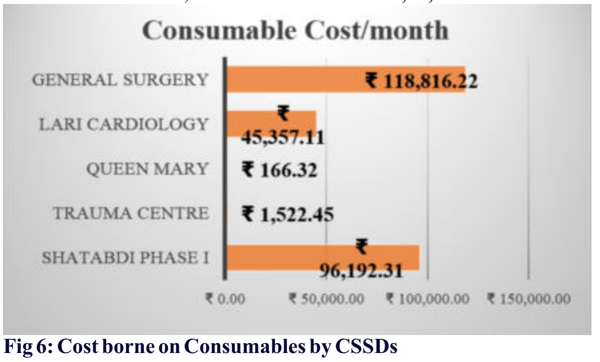

Fig 6: Cost borne on Consumables by CSSDs

4. RESULT

Overall cost incurred on all CSSD comes out to be ₹ **13,09,445.98/month** using Absorption costing method**.**

5. DISCUSSION

Of the total CSSD operating cost, 43% cost borne on manpower, 22% on electricity and water, 20% on consumables, 12% on machine and 3% on building.

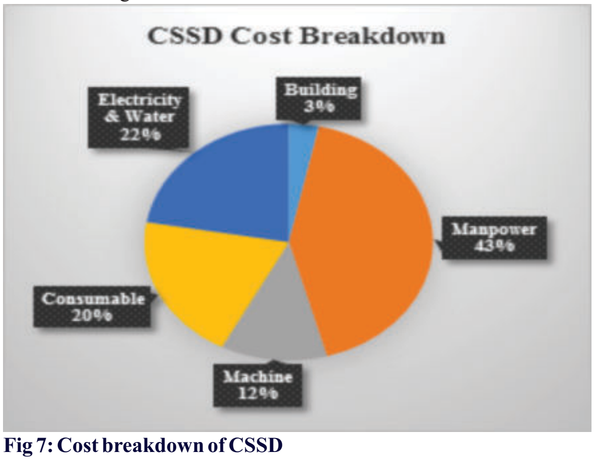

Fig 7: Cost breakdown of CSSD

Siddharth V et al. found that, total operating cost of CSSD in a 200 bedded Trauma Centre for 2011-2012 was ₹18,79,079. [8] Tabish S A, in his research on CSSD of a 500 bedded tertiary care medical institute in 1992-1993, calculated the overall cost of CSSD operations to be ₹15,28,320/year and ₹3,765/day using average costing technique. [1] Kakinada K et al. found in their study that the highest proportion of expenditure in CSSD was borne by manpower (33%) followed by consumables (29%), equipment (18%), electricity (11%) and building (10%). [9] Our study's results are somewhat in agreement with Kakinada K et al. with manpower being the highest cost driver in CSSD.

Majority expenditure is done by General Surgery CSSD (37%) followed by Shatabdi Phase I (33%), Lari (CTVS) (13%), Trauma Centre (11%) & Queen Mary's CSSD (6%).

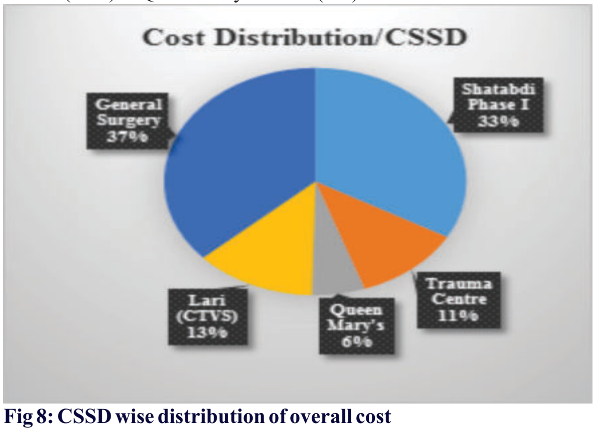

Fig 8: CSSD wise distribution of overall cost

Cost Per Unit

Unit cost of sterilization process in all CSSD is determined by total surgical bed count and operational cost. The highest unit cost was for Lari (CTVS) at ₹85.35, followed by General Surgery at ₹51.69, Shatabdi Phase I at ₹26.31, Trauma Centre at ₹10.62, and Queen Mary's CSSD at ₹.24. There are no published studies on the cost of CSSD based on surgical beds in India.

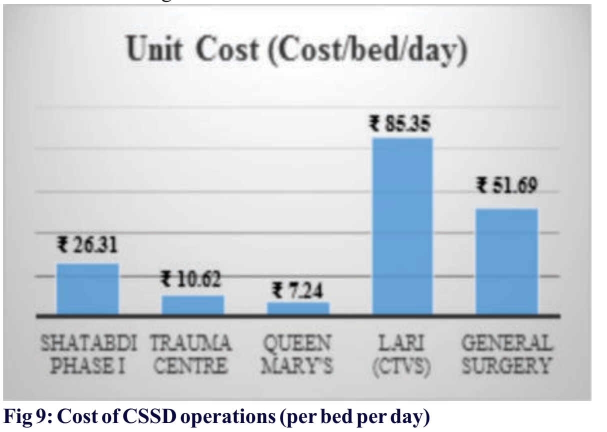

Fig 9: Cost of CSSD operations (per bed per day)

6. CONCLUSION:

The CSSD processes followed in Lari (CTVS) and General Surgery involved cleaning, disinfection, drying, packing, labelling, sterilization, storage, and distribution, resulting in costs of ₹85.35 and ₹51.69, respectively. In Shatabdi Phase 1 and Trauma Centre CSSD, only labelling, sterilization, storage, and distribution were performed, resulting in costs of ₹26.31 and ₹10.62, respectively. Queen Mary's CSSD was responsible only for sterilization and storage, with a cost of ₹7.24. Therefore, an average cost of **₹68.52/day** [(85.35 + 51.69) / 2] can be estimated, taking into account the operating cost of Lari (CTVS) and General Surgery CSSD. These findings could assist hospital administrators in making informed decisions, improving process performance, and allocating budgets more efficiently for CSSD operations.

Ethical considerations:

In accordance with ethical guidelines and principles, the study was conducted.

Conflicts of interests: None

Source of funding: Nil

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PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

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