



Cost Analysis of Dietetic and Therapeutic Services in a Hospital. A Study at A Tertiary Care Academic Institution in Northern India

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ABSTRACT

Background

In public sector hospitals in India where majority of the patients are provided free of cost dietary services, a good percentage of total hospital budget is allocated to the Dietetics and Therapeutics department.

Objective

To determine the cost of diet per patient per day in Dietetics and Therapeutics department of SKIMS.

Study Design

This was an observational study conducted prospectively.

Methodology

The analysis was done using secondary data which was collected from the following sources: verified validated data collection sheets, hospital records and

diet records of the 1215-bedded Sher-i-kashmir institute of Medical Sciences (SKIMS) tertiary care teaching hospital, during the period of 01/10/2019 to 31/03/2020. The cost analysis was done using unitary method.

Results

Total six-monthly expenditure of Rs.31, 404, 335.76 was incurred on the dietary service. An average of Rs. 265.08 was spent by the hospital on diet/patient/day. Direct labour costs on preparation and distribution of food was Rs.183.06/patient/day. Direct material cost of raw material used was Rs.73.02 /patient/day. Indirect expenditure was Rs.9.005/patient/day.

Conclusion

It becomes important for the hospital administrators to give priority on the financial management of dietary services. Analysis of unit costs will enable hospital administrators to work with cost consciousness and consequently to improve efficiency. It will help them to contemplate the economic advantages of outsourcing services versus using in-house staff.

Keywords

Unit cost, Tertiary care teaching hospitals, Dietary service, Dietetics and Therapeutic department.

INTRODUCTION

Hospital Dietetics and therapeutic department is one of the important support services of a hospital. Hospital dietary services play a vital role in patient healing and early recovery. Dietary service quality also influence patients' satisfaction with their overall hospital experience.¹ Promoting best dietary status through quality hospital dietary services can lead to aearly improvement and decreased average length of hospital stay of the patient in the hospital which in turn have a big impact on hospital budget.²⁻³As a result, hospital administrators are paying more attention on patient care in an attempt to enhance patient satisfaction and control hospital costs.⁴⁻⁶To improve efficiency and effectiveness, accurate and appropriate cost information is very essential. While the staff tends to work with cost consciousness, policy makers and hospital administrators use cost information to improve the efficiency and quality of work and effectiveness of financial management in the institutions. They may also use such information for the purpose of resource allocations, guideline preparation, setting priorities, identifying necessary infrastructure facilities and for new innovations to

improve the performance of the hospitals. Cost analysis is of utmost importance especially in health care systems which manage with scarce resources. Moreover, diet cost is one of the cost items that have not been analysed frequently.⁷Keeping these aspects in mind a study was planned at SKIMS Srinagar, which is a tertiary care teaching hospital having a bed capacity of 1215, for doing the cost analysis of dietary services. The hospital has in-house dietetics and therapeutics department and is providing the services to all the indoor patients. The understanding of costs (both unit and total) will assist in forecasting of upcoming budgets and to highlight how much it costs per meal per patient to the government.

MATERIAL AND METHODS

This study was a prospective observational study conducted over a period of six months from 01/10/2019 to 31/03/2020 in Dietetics and Therapeutic department of SKIMS. Ethical clearance was obtained from Institutional Ethics Committee SKIMS. Confidentiality of the information was assured. The average unit cost of diets served to in-patients was calculated after adding following costs.

A) Direct Costs

Material cost was based on the quantity of all the raw material used per day in patients kitchen for preparation of all the meals including breakfast, lunch, evening tea and dinner served to in-patient. The Labour cost was calculated on the basis of information collected from the accounts section about the actual staff employed in patient's kitchen and their monthly wages including permanent staff, labourer and daily wagers.

B) Indirect Costs

There is no metered supply of electricity for the

D&T department at SKIMS, the cost of electricity was calculated on the basis of actual electric load of the electrical gadgets as specified by the manufacturers, taking load factor 33% and multiplying it by the tariff rate Rs 6.88 /unit and electricity duty @ 10% as issued by Power development department. Steam cost was worked out on the basis of steam consumption by different boiling pans based on the specification given in the working manual and taking into consideration cost of high speed diesel used as per the information provided by Mechanical Engineering department. (L.P.G cost) was based on actual daily L.P.G consumption in the patient’s kitchen and its monthly cost was worked out from the records from the estate department of SKIMS. Building cost was calculated by physically measuring the area occupied by the Patient kitchen. Initially the land was donated to the SKIMS, Soura free of cost. However for doing the costing, the cost of land and building was calculated based on the current prevailing rates (as per CPWD guidelines 2019).The maintenance cost of building and its fixed assets was calculated on the basis of actual maintenance cost during the study period. The cost of water consumption was

calculated on the basis of average quantity consumed per day in the dietetics and therapeutic department. Total number of water taps and water discharge per tap per hour was taken to calculate daily water consumption. Other miscellaneous costs include the cost of cleaning material, uniforms, etc. of the staff working in patient kitchen and other stationary items. These costs were calculated on the basis of actual month-wise consumption of each item and their price per unit from the store.

Unit cost per patient per day was determined by the formula given below:

$$\text{Unit cost} = \frac{\text{Total cost (A+B) /for six months}}{\text{No. of in-patients served during six months}}$$

RESULTS

The total numbers of 118601 in-patients were served during the study period of six months. As depicted from (Table 1) the monthly labour cost ranged between Rs.3467580 to 3662819 and an average monthly cost was Rs. 3618584.33. The month-wise labour cost per patient per day ranged from Rs.175.42 to Rs.189.90 and an average labour cost was Rs.185.06 per patient per day on the dietary service to in-patients.

Table 1: Labour Cost

S.No	Month	Cost / month (in Rs)	Cost / Patient /day (in Rs)
1.	October 2019	3467580	175.42
2.	November 2019	3595707	189.90
3.	December 2019	3659762	185.14
4.	January 2020	3662819	185.30
5.	February 2020	3662819	185.30
6.	March 2020	3662819	185.30
Average cost		3618584.33	183.06

Material cost included the cost of all the materials used in preparation of all the meals including breakfast, lunch, evening tea and dinner served to patients. Table 2 showed the month wise and average material cost per patient per day. The total material cost was Rs.85 43270 for Six months, whereas an average monthly cost was Rs.1423878.33 & average daily cost was Rs 47462.56. The material cost per

patient was on an average was Rs.73.02. Approximately 1/5th of the expenditure was incurred on Fresh milk (21.46%), followed by chicken (18.07%), bread (11.98%), rice (11.14%), eggs (6.74%), cheese (2.88%), oil refined (2.80%), butter & Lipton tea both (1.80%) etc. It is clear from the study that maximum cost of materials was of Fresh milk, chicken, bread and rice (62.65%).

Table 2: Material Cost

S. No	Month	Monthly Cost (Rs)	Daily Cost (Rs)	Cost/Patient/Day (Rs)
1	October- 19	1472266	49075.53	75.50
2	November- 19	1435024	47834.13	73.59
3	December-19	1452866	48428.87	74.51
4	January- 20	1496478	49882.60	76.74
5	February-20	1392697	46423.23	71.42
6	March-20	1293939	43131.30	66.36
7	Average cost	1423878.33	47462.56	73.02

The total electricity cost has been estimated as Rs. 2829.09/day based upon the tariff rate. The six monthly and the monthly charges have been calculated as Rs 5,09,236.20 and Rs. 84,872.70 respectively. On the basis of daily electricity charges,

the actual electricity cost per patient per day has been estimated Rs 4.29. This was calculated with the help of Electrical department SKIMS. Details of electricity consumption and its cost is shown in (Table-3)

Table 3: Electricity Consumption and its cost

S. No	Electric Gadgets	No.	Consumption per No.	Total Electricity Consumption
1.	Cold storage	2	4 KW	8 KW
2.	Geyser (Large)	2	3.5 KW	7 KW
3.	Geyser (Small)	7	2 KW	14 KW
4.	Radiators	5	200 watt	1 KW
5.	Flood Lights	4	250 watt	1 KW
6.	Single tube fixtures	20	75 watt	1.5 KW
7.	High Mask Lights	250	6 watt	1.5 KW
8.	Exhaust Fan Multi Size	12	350 watt	4.2 KW
9.	Heater blower	6	1500 watt	9 KW
Approximate Total load = 47.2 KW				

The capital cost of building @ Rs.26800per square meters (as per CPWD guidelines) was calculated which came out to be Rs.180.89 lacs. Assuming the life of building to be 100 years, the depreciation of the building and its fixed assets was taken @ 1% which came out to be Rs 1,80,89 per year, Rs.1,14,500 per six monthly, Rs.19,083per monthly and from this depreciation cost of building per patient per day was calculated which came out to be Rs.0.97. Details of Building cost and fixed costs of Dietetics &

Therapeutic department during the study period is shown in (Table-4).The actual maintenance cost came out to be Rs.98449 per annum, Rs.8204.08 per day and Rs.0.42 per patient per day. Details of actual maintenance cost of building and its fixed assets are shown in (Table 5).The total cost (depreciation and maintenance) of both building and fixed assets per patient per day was calculated which came out to be Rs.1.39.

Table 4: Civil work

Plinth area	552 Square mts.
R.C.C frames structure up to 6 storeys as per Centre CPWD plinth area rates (June-2019)	Rs 26800 / Square mts.
Basic civil cost of building	Rs 14793600
Extra for CGI TRUSS Area for CGI truss increased by 10% Cost/SQM Truss	607 Square mts Rs 4500
Cost of Truss	Rs 2732400
Extra for Kota stone flooring	Rs 563040
Overall Civil cost of structure	Rs 18089040 Rs 180.89 lacs

Actual Maintenance cost of Building and its fixed assets

Table 5: Actual Maintenance cost of Building and its fixed assets

Maintenance cost / year (in Rs.)	Maintenance cost / month (in Rs.)	Maintenance Cost / patient / day (in Rs)
98449	8204.08	0.42

Total water consumption has been calculated to be 43200 litres per day which was based on the assumption that total hours of utilization per day was 6 (2hours each in morning, evening and night). The total quantity of water consumed per year was estimated to be 157.6 lac litres and its cost came out to be Rs.1298.62 which was taken at the rate of

Rs.8.24/lac litres as per Civil Engineering Department SKIMS. The cost of water was calculated on an average per six month and per month, which came out to be Rs. 649.31 and Rs.108.22 respectively, which after dividing among the number of in-patients served per day estimated to be Rs.0.005 per patient per day. (Table-6)

Table 6: Water Cost

No of Taps	Water per hr per tap (litres)	Hours Utilization (per day)	Total water/ day utilization
12	600	6 (2hrs each morning, evening & night)	43200 litres

The monthly cost of steam ranged between Rs.48720 to Rs.50592. Cost of steam for six months was Rs.303024, whereas monthly and daily steam cost were Rs.50504 and Rs.1683.46 respectively. Then the

steam cost per patient per day was estimated which by dividing the steam cost per day by the number of in-patients served per day which came out to be Rs.2.55. (Table-7)

Table 7: Steam Cost (Month- wise)

S. No	Month	Steam Cost per month (In Rs)
1.	October 2019	50592
2.	November 2019	48960
3.	December 2019	50592
4.	January 2020	52080
5.	February 2020	48720
6.	March 2020	52080

The daily cost of L.P.G has been recorded and total cost of L.P.G used during the study period was calculated which came out to be Rs.14784 /six months which was divided by the total number of in-patients served per day to give per patient per day L.P.G cost equal to Rs. 1.24

Cost Distribution in Dietary Service

The average expenditure per patient per day incurred on manpower / labour and dietary raw material were found to be Rs.183.06 and Rs.73.02 respectively both

representing the direct costs components. The average expenditure per patient per day incurred on electricity was Rs. 4.29, Building, water, steam, L.P.G, Equipment were Rs.0.97, Rs.0.005, Rs.2.55 and Rs.1.24 respectively all representing the indirect cost components. The average cumulate cost on diet per patient was calculated to be Rs.265.34 on the basis of total six monthly expenditure of Rs.31,404,335.76 shown in (Table 8).

Table 8: Components of Total dietary cost

S. No	Cost category	Cost in Rupees		
		Six Monthly	Monthly	Per Patient Per Day
A	Direct Cost			
	1.Material cost	Rs.8543270	Rs.1423878.33	Rs.73.02
	2.Labour cost	Rs.21711506	Rs.3618584.33	Rs.183.06
	Total direct cost per patient per day			Rs.256.08
B	Indirect Cost			
	2)Electricity Cost	Rs.509236.20	Rs.84872.70	Rs.4.29
	3)Steam cost	Rs.303024.00	Rs.50504.00	Rs.2.55
	4)L.P.G cost	Rs.147484	24580.66	Rs.1.24
	5)Building cost	Rs.163724	Rs.27287.33	Rs.0.97
	6)Water cost	Rs.649.31	Rs.108.21	Rs.0.005
	Total Indirect Cost per patient per day			Rs.9.005
C	Total diet cost per patient per day	Rs.31404335.76		Rs.265.08

DISCUSSION

Healthcare cost is increasing daily due to improving technology, increasing people needs, expectations and advancement in health care. Further, epidemiological and demographic transition in the world has posed a big challenge in health services. The trend of rising non communicable diseases among citizens and continuously increasing proportion of elderly population make the health care expenditure unbearable to a developing country like India. The cost of dietary services per patient per day in SKIMS which included three meals was calculated as Rs 265.08. In a study conducted at Chandigarh by Sharma RK et al⁸ it was found that per diet cost incurred in their hospital was Rs 70.49 but this was

the cost of an individual diet. Similarly, a study was carried out at premier tertiary care hospital at New Delhi by Dass B et al⁹ and it was concluded that the per day cost of food in private type A room is Rs 276. In the study conducted outside India in Sri Lanka 2016 by Rathnanayake RMSS et al¹⁰ in a Teaching Hospital Kalubowilia the unit cost per patient per meal was Rs.119. When we compare the cost of dietary services with the different hospitals, it was found that the per patient per day cost of diet is higher in SKIMS which came out to be Rs 265.08. These studies have been carried out in different time periods. In general, the Primary reason for a cost change between two time periods and different area could be

changes in input prices, changes in input productivity or changes in departmental volume. Thus the difference in cost may be attributed to any of the above factors and it need more study for doing the comparative analysis.

LIMITATIONS

For reducing the complexity of calculations some overhead cost centers like infection control unit, quality control unit and health education unit were not considered in cost calculation. Expenditure for training of staff were not considered in the current study. Although Equipment costs in the kitchen after depreciation was calculated but the data on life of few equipments was not available e.g long years of service (more than 10 years) hence, minimum impact into the cost analysis. There was no equipment for calculating steam consumption so the data was taken from Mechanical Engineering department. There was no separate electricity meters at SKIMS for Dietetic and Therapeutic department. Hence, it was an extremely difficult to apportion the total electricity bills to the total square area.

CONCLUSION

Dietary and therapeutic services in most hospitals in India do not receive the importance they deserve. Very few literatures are available on cost analysis of dietary services in hospitals in India. The present study therefore was mainly aimed at the Cost analysis of Dietetics and Therapeutic services provided by Sher-i-Kashmir Institute of Medical Sciences Soura Srinagar, the city which caters to patients from various districts of Kashmir. Evaluation of the cost of dietary services at the institute has drawn recommendations for reduction in Dietary costs.

RECOMMENDATIONS

The labour cost revealed from our study was Rs 183.06 which contributed maximum share of 71.04% of total per patient per day dietary cost. We recommend the hospital administration to ponder upon outsourcing the staff of Dietetic and Therapeutic department, with due considerations to quality of service so that it is not compromised. It is advisable to introduce an awareness programme to the D&T staff, to highlight how much it costs per patient per day to the Institute.

ETHICAL STATEMENT

This study was approved by the Institutional Ethics Committee of SKIMS with the Reference Number IEC/SKIMS Protocol # RP 68-B/2020. The written informed consent was obtained from the participants in the study.

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