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Cost study of three selected laboratory investigations at different levels of healthcare institutions in Western Province, Sri Lanka

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ABSTRACT

Introduction: The cost of laboratory services has become a challenge for continuing free healthcare in developing countries like Sri Lanka.

Objectives To undertake cost estimation and cost comparison of three selected laboratory investigations at different levels of healthcare institutions in the Western Province.

Methodology: A descriptive cross-sectional study was carried out from May 2019 to July 2019. The analysis was based on secondary data collected from Lady Ridgeway Children's Hospital Colombo (LRH), Base Hospital Horana (BHH), and Divisional Hospital Bandaragama (DHB), during the study period. The cost analysis was performed using the step-down method.

Result:s Total cost of FBC, CRP, and UFR tests were calculated, and compared among three hospitals. The total cost of FBC in the LRH, BHH, and DHB was Rs.301.16, Rs.255.19, and Rs.380.83 respectively. The total cost of CRP in those hospitals was Rs.264.46, Rs.237.70, and Rs.85.63 while the total cost of UFR was Rs.130.21, Rs.126.42, and Rs.81.83 respectively.

Discussion: The highest cost of FBC as revealed by this study was in DHB. It comprised of a high equipment cost per test. Though the LRH possesses a high-tech hematology analyzer, the higher volume of investigations done makes the equipment cost less per test in the LRH. The cost of testing CRP, in the order of highest to lowest, was in the LRH, BHH, and DHB. The reason for the lowest cost of CRP in DHB can be attributable to the non-usage of reagents and less equipment cost due to manual handling. The cost of UFR was comparatively low in DHB. It can be due to the contribution of low salary cost and low cleaning service cost because of less human resource usage.

Conclusion This study reveals that the lower a hospital in the hospital hierarchy the cost of investigations tends to increase. This can be attributable to the fact that the number of investigations done is relatively less in smaller hospitals. At macro economical level, this is a challenge to the efficient utilization of scarce resources.

Recommendation: In keeping with the primary health care reforms, it is proposed to channel investigations from primary medical care units to divisional hospitals. Thereby utilization of investigative equipment could be optimized.

INTRODUCTION

In Sri Lanka, laboratories are available in both government and private health sector. In the government sector, curative care institutions can be categorized into three level1.

- Primary care institutions (Divisional Hospital type A, Divisional Hospital type B, Divisional Hospital type C, Primary Medical Care Unit)

- Secondary care institutions (Base Hospital type A, Base Hospital type B)
- Tertiary care institutions (National Hospitals of Sri Lanka, Teaching Hospitals, Provincial General Hospitals, and District General Hospitals)

Laboratory investigations are available at all these levels as appropriate to each. Laboratory services are imperative for confirming the diagnosis, seeing the effectiveness of the treatment, and identifying possible risk factors by screening for diseases 2. Therefore, the availability of quality laboratory services is vital.

Justification

This study intended to find the cost of selected investigations in different levels of healthcare institutions in Sri Lanka**.** Such information is useful for the Ministry of Health to determine the norms for each care level and will help to improve the awareness of both the staff and the public about the cost of services. Cost awareness is a way of achieving optimized services and resource utilization. Underutilization of primary healthcare and gaps in prioritizing laboratory services can be identified as out-of-pocket expenditures3.

Offering quality laboratory services for screening, diagnosing, monitoring, and maintaining proper care is imperative. In this sense, focusing on the cost at different levels of hospitals is important since it allows the costs to be linked to differences in resource availability and the patterns of facility utilization. This study selected the Lady Ridgeway Children's Hospital Colombo (LRH) as a tertiary care institution, Base Hospital Horana (BHH) as a secondary care institution, and Divisional Hospital Bandaragama (DHB) as a primary care institution. These institutions are in the same Province with similar socio-economic backgrounds and epidemiological patterns. Therefore, the cost can be compared across the different care levels of the Sri Lankan health system.

General Objective

To undertake cost estimation and cost comparison of three selected laboratory investigations at different levels of healthcare institutions in the Western Province

Specific objective

1. To estimate the unit cost of selected three laboratory investigations at three different levels of health care institutions in Western Province.
2. To compare the unit cost of each investigation at three different levels of healthcare listed in the objective 1
3. To identify the factors that drive the cost of investigation at each level of care.

LITERATURE REVIEW

Sri Lanka is a country that provides free health services to all its citizens while struggling to cope with trending economic challenges and evolving global market conditions[4.] Constantly, the healthcare

expenditure in Sri Lanka has shown a similar pattern with a 72% spent on curative services and only 3% on preventive services, while 20% spent on purchasing drugs, medical equipment, and supplies for medical investigations over the years from 2014 – 2016. Thus, accurate allocations to different components will be well-guided if the costs of different service provisions are available[4,5].

METHODOLOGY

A cross-sectional descriptive study was carried out attempting to study the total cost of selected laboratory investigations at three hospitals of different care levels. The study selected the LRH as a tertiary care institution, BHH as a secondary care institution, and DHB as a primary care institution. The laboratory of all three hospitals receives samples directly from the wards and the Outpatient Department (OPD).

Among many others, Full Blood Count (FBC), C-Reactive Protein CRP), and Urine Full Report (UFR) were selected considering the availability at all levels. The study was conducted from May 2019 to July 2019 and data collection was done during the same period. The data were extracted from the laboratory records. The total number of investigations done during the study period at each institution was considered in the study. Therefore, all the FBC, UFR, and CRP tests that were performed at the OPD laboratory settings during the study period were included, but investigations performed in the wards or at night were excluded.

The total cost of each investigation included all the costs from the time of drawing blood to the issuing of the report. All the identified elements that had contributed to the cost related to the selected investigations were listed. The list included direct, indirect, and other costs including salaries, material costs, equipment costs, and other relevant costs incurred to sustain the laboratory operations. Finally, the total cost was determined based on the step-down method[6] of costing.

In this cost analysis, the fixed capital cost (land, buildings, furniture, equipment, and the cost of other fixed assets) and recurrent/variable costs (water, electricity, cleaning, telephone, stationary, consumables, reagent, and staff salary) were considered under the relevant heads of direct, indirect, and other costs. However, the buildings are more than 25 years old in all three hospitals while the land cost tends to vary significantly due to prevailing market conditions. Therefore, the costs of buildings and land were ignored due to the fact that adding those values can impart a huge impact on the final cost estimation[7,8].

The study was carried out after obtaining approval from the respective administrative authorities of the selected hospitals. Ethical approval was obtained from the Ethics Review Committee of the LRH.

RESULTS

The frequency distribution of FBC, CRP, and UFR done in each selected institution is shown in Table 1.

Table 1. Number of investigations done in the three OPD laboratories at LRH, BHH , and DHB

Investigation	Number of investigations d one		
	LRH	BHH	DHH
FBC	8770	4952	1726
CRP	466	4594	764
UFR	3351	2788	1135

The results of the cost analysis of those selected investigations based on the estimated total costs and the number of blood/urine samples investigated during the study period are shown in Table 2.

Accordingly, the cost of a FBC in the LRH, BHH, and DHB was Rs.301.16, Rs.255.19, and Rs.380.83 respectively. The cost of a CRP rest was Rs.264.46, Rs.237.70, and

Table 2. Total cost per investigation in LRH, BHH, and DHB

Cost element		**Cost in each Hospital (LKR)**								
		LRH			**BHH**			**DHB**		
Furniture		0.3			0.10			.15		
Equipment cost	FBC	18.59			9.57			208.79		
	CRP	14.89			37.08			5.59		
	UFR	5.64			0.80			1.79		
Salary		77.17			82.17			37.70		
Electricity		5.00			4.17			5.70		
Water		0.40			0.20			0.12		
Cleaning Services		4.50			2.60			-		
Consumables		35.9			34.90			34.9		
Stationery		1.30			1.48			1.47		
Reagent cost	FBC	158			120			92		
	CRP	125			75			-		
Estimated cost of	.									
FBC		**301.16**			**255.19**			**380.83**		
	CRP	**264.46**			**237.70**			**85.63**		
	UFR	**130.21**			**126.42**			**81.83**		
Final cost allocation		FBC	CRP	UFR	FBC	CRP	UFR	FBC	CRP	UFR
Direct cost		18.89	15.19	5.94	9.67	37.18	0.90	208.94	5.74	1.94
Indirect cost		282.27	249.27	124.27	245.59	200.52	125.52	171.89	79.89	79.89
Estimated total cost		**301.46**	**264.46**	**130.21**	**255.19**	**237.70**	**126.42**	**380.83**	**85.63**	**81.83**

Rs.85.63 while the cost of a UFR was Rs.130.21, Rs.126.42, and Rs.81.83 respectively in the same hospitals.

According to the results, a comparison of the total cost of each investigation at three different levels of healthcare was done and identified the factors that drive the investigation costs at each level of care.

DISCUSSION

Though there was no wide variation in the percentage of the recurrent cost for FBC testing of the cost centers, a significant difference was observed in the range of cost at the cost centers. The lowest value was seen at BHH. In DHB it recorded the highest value as there was a considerably higher contribution of the equipment cost with a lesser number of tests that had to perform. The cost of a FBC was the highest in DHB and lowest in BHH. It was because of the unusually high cost of equipment in DHB. The considerations on the calculation of the capital and recurrent cost for the CRP test were similar to the FBC. There was a significant variation in both capital and recurrent costs at the cost centers. The highest capital cost contribution for CRP testing was recorded at the LRH due to the higher capital cost of equipment. The lower capital cost was due to manual methods of performing tests and therefore, there was no added equipment cost. In recurrent cost, there was no significant difference. The reason for the higher cost at LRH was mainly due to the high cost of equipment used.

In all three hospitals, the UFR is done manually. However, the cost of a UFR in DHB was comparatively low due to lower salary and cleaning costs associated with lesser human resource usage. In LRH cost of UFR was Rs.130.21 while it was Rs. 81.00 in DHB. Compared to LRH and BHH, the number of UFR tests performed in DHB was low. This can be due to the lower density of the draining population. However, the DHB exceeded the human resource efficiency compared to the other two hospitals.

The cost of a CRP test in the order of highest to lowest was LRH, BHH, and DHB. The reason for the lowest cost of a CRP in DHB could be attributable to the non-availability of reagents and less equipment cost associated with manual handling. Laboratory cleaning was done by the ordinary laborer

(SKS) attached to the laboratory. Therefore, no additional cost was incurred as in LRH and BHH. Many types of investigations in large numbers are done in the same biochemistry analyzer in the LRH leading to less equipment cost assignable to each investigation. However, the regent cost in LRH is considerably high due to high-tech machine-specific reagents. The reason for the high equipment costs in BHH could be attributable to the high depreciation cost.

CONCLUSION

If the FBC, CRP, and UFR testing was done in the private sector in Western Province, the average cost for testing amounted to Rs.630.00, Rs.760.00, and Rs.540.00 respectively. This revealed that the provision of government services in terms of providing laboratory services can be highly effective in reducing out-of-pocket expenditure. On the other hand, there is a higher public expectation of the reliability of government services. These facts justify the provision of effective, efficient, and quality laboratory services in the public health sector. Therefore, all the possible measures should be taken to optimize the utilization of resources.

RECOMMENDATIONS

This study suggests minimal manpower for testing and cleaning, emphasizing the need for evidence-based management of resources for higher cost-effectiveness. Less cost is associated with less usage of human resources. Therefore, the introduction of cost reduction strategies through the awareness of the health staff and the patients will help to reduce the cost of care at large. Furthermore, the maintenance and the planning of equipment on time will also help to reduce the cost of laboratory investigations. Improving the hospital record-keeping system is also recommended. Such measures will improve the outputs of costing studies providing more reliable information for decision-making.

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