



Changes in a Hospital's Costs and Revenues Before and After COVID-19: A Case Study of an Iranian Hospital

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Abstract

Background: The Coronavirus Disease 2019 (COVID-19) pandemic has caused a severe shock to the world economy and, consequently, healthcare systems.

Objectives: The current study aimed to investigate changes in costs and revenues of an Iranian hospital before and after the COVID-19 pandemic to answer the following question: "How can hospital costs and revenues change during the COVID-19 pandemic?"

Methods: This descriptive cross-sectional study was conducted retrospectively at the Masih Daneshvari Hospital in 2020. Accounting software available at the hospital (Azarakhsh for salary costs and PMQ for medical equipment costs) was used to collect cost information. Also, the hospital information system software was used to collect revenue information. The 2019 financial year was considered the base year, and the period February-August 2020 was considered the COVID-19 outbreak period. The data were entered into Excel software and analyzed using descriptive statistics methods.

Results: Before the COVID-19 outbreak, the Masih Daneshvari Hospital was facing many cost problems, and the new crisis added to the severity of the problems. In total, the hospital's revenue declined by 9%, and its costs increased by 70%. Therefore, in the fiscal year ending in March 2020, the hospital balance was reported to be \$-607,143 (-68,000 million Iranian Rial).

Conclusions: The soaring healthcare expenditures revealed that the hospital was not ready to deal with the disease. As the COVID-19 outbreak grows rapidly in Iran, there is a pressing need to increase medical capacities and inpatient beds to treat infected patients. Hospitals in the country face financial problems and should be supported by the Ministry of Health and Medical Education.

Keywords: COVID-19, Hospital Costs, Hospital Revenues

1. Background

Hospitals and other healthcare organizations are increasingly faced with a challenging environment characterized by high competition. High focus on the quality of patient care, soaring healthcare costs, and intense competition are among the factors that have required hospitals to develop new strategies to manage their costs (1). The Coronavirus disease 2019 (COVID-19) outbreak is a global threat to both health and economic systems (2, 3). The broad impact of the pandemic has sharply increased the demand for healthcare services, and the high mortality rate of COVID-

19 has significantly affected healthcare systems (4).

In the current economic situation, there is pressure on hospitals to reduce costs (5). The COVID-19 pandemic has caused a severe shock to the world economy and, consequently, healthcare systems (6). Due to fixed tariffs, delayed insurance reimbursements, and several other problems, hospitals suffer from financial pressures. Reduced surgical procedures and elective admissions have intensified the condition (7). According to the latest available data, hospital revenues have declined sharply since the onset of the pandemic, mainly due to the reduced num-

ber of elective services and procedures. After confirming the first cases of COVID-19 in Iran, several multi-specialty and single-specialty hospitals were turned into special centers for treating COVID-19 patients, following the decision made by the Ministry of Health and Medical Education (MoHME) (3). Hospital outpatient visits have also decreased considerably. Moreover, due to fear of COVID-19, the total number of canceled elective procedures has increased considerably. Hence, many hospitals are not using their full capacity (8). Identifying cost and revenue structures is a fundamental issue for hospitals, as it helps managers identify changes in revenues and costs and, consequently, implement necessary measures. Using managerial reports and assessing hospital indicators are essential strategies for planning, organizing, and managing healthcare centers to use resources efficiently (9).

The Masih Daneshvari Hospital is the only referral center for pulmonary diseases in Iran and the region, which provides healthcare services related to tuberculosis (TB) and pulmonary diseases. The center also acts as the transplant referral center affiliated to the Shahid Beheshti University of Medical Sciences, with more than 200 heart and 100 lung transplants. The Masih Daneshvari Hospital is also the World Health Organization (WHO) collaborating center for TB education and tobacco control. Moreover, the hospital acts as the National TB Reference Laboratory, National Reference HPV Laboratory, and Influenza Reference Laboratory for Tehran and Alborz provinces. The hospital has patients from all corners of the country. Since the onset of the pandemic in Iran, the hospital provides its routine services and services to COVID-19 patients; however, one of the reasons for the decrease in the number of patients was the clients' fear of treatment in this center for diseases other than COVID-19. The hospital's general intensive care unit has 22 beds, of which 15 have been newly added. Also, ten beds have been added to the hospital's infectious diseases emergency department. In total, 92 beds are specially allocated to COVID-19 patients.

2. Objectives

The current study aimed to investigate the costs and revenues of the Masih Daneshvari Hospital before and after the COVID-19 pandemic to answer the following question: "How can hospital costs and revenues change during the COVID-19 pandemic?"

3. Methods

This quantitative, descriptive, cross-sectional study was conducted retrospectively at the Masih Daneshvari

hospital in 2020. The main objective was to investigate the cost and revenue of the hospital before and after the COVID-19 pandemic. Accounting software available at the hospital (Azarakhsh for salary costs and PMQ for medical equipment costs) was used to collect cost information. Also, the hospital information system software was used for revenue information. The 2019 financial year was considered the base year, and the period February-August 2020 was considered the COVID-19 outbreak period. Initially, the total revenue for the study period was calculated, and then it was separated by source (i.e., insurance reimbursements, government subsidies, patient payments, and discounts). The total cost was considered the sum of expenditures related to human resources, medicine and medical supplies, general affairs, and construction, and then changes were calculated. All costs and revenues were calculated in Iranian Rial (IRR) and converted to USD according to the 2019 flexible exchange rate of USD 1 = IRR 112,000. Excel software was used to perform all calculations. The data were entered into Excel software and analyzed using descriptive statistics methods.

4. Results

Information on the hospital's revenue, separated by inpatient and outpatient services, is provided in Table 1. Although the COVID-19 has caused structural changes in the hospital's departments, revenues did not change significantly.

Changes in the hospital's revenue before and after the COVID-19 pandemic are provided in Table 2. Except for bed and lab revenues, other revenues have declined during the COVID-19 outbreak. The highest reduction rate was related to the patient's companion, and the lowest rate was related to medications and consumable medical supplies. Overall, the hospital's revenue declined by 9%.

The income deficit increased in consecutive months, and it was intensified with increased costs and reduced revenues due to the outbreak. As shown in Table 3, the largest share of costs was for human resources, followed by medicines and medical supplies, non-construction support, and construction support. The total salary paid to the hospital's personnel has been increased by 20% since the onset of the outbreak. However, the lowest increase in costs was for human resources despite their importance in managing the outbreak. Costs related to medicines, including medicines and medical supplies, personal protective equipment (PPE), and disinfectants, increased by 129%. Since the onset of the outbreak in Iran, \$67 (IRR 7,500,000) was spent per bed for PPE in the hospital's general and special wards. The hospital was obliged to provide full PPE for

Table 1. Hospital's Revenue Before and After COVID-19 Pandemic

	Year 2019 (%)	Year 2020 (%) (During COVID-19 Pandemic)
Proportion of inpatient revenue to total revenue	83	81
Proportion of outpatient revenue to total revenue	17	19
Sum	100	100

Table 2. Hospital's Revenue Before and After COVID-19 Outbreak

Revenue Component	Before COVID-19 (\$)	After COVID-19 (\$)	Change (%)
Visit	551,762	479,731	-13
Bed (hospitalization)	1,667,745	1,759,914	6
Medications and consumable medical supplies	1,101,680	1,071,060	-3
Surgery and anesthesia	637,817	371,360	-42
Laboratory	585,866	620,808	6
Medical imaging	87,359	62,173	-29
Chemotherapy	22,068	17,412	-21
Patient's companion	62,299	18,205	-71
Other services	200,391	97,425	-51
Total	4,916,987	4,498,087	-9

all the personnel. Moreover, costs of non-construction support, including laboratory kits, detergents, cooking and distributing food, and oxygen consumption, increased by 220%. In total, \$1,821,429 (IRR 204,000 million) was spent on laboratory kits to identify positive cases. Additionally, construction costs for preparing and equipping medical departments and maintaining medical equipment increased by 500%.

Before the COVID-19 outbreak, the Masih Daneshvari Hospital was facing many cost problems, and the new crisis added to the severity of the problems. Therefore, in the fiscal year ending in March 2020, the hospital balance was reported to be \$-607,143 (IRR -68,000 million).

5. Discussion

The present study aimed to investigate changes in revenues and costs of the Masih Daneshvari Hospital since the onset of the COVID-19 outbreak in Iran. The study revealed the shortage of the hospital's resources during the outbreak. One of the most critical measures to deal with resource shortages during crises is to adopt timely policies tailored to the situation (10). According to the international experience, by adopting timely policies focused on identifying and supporting those in need, which leads to appropriate allocation of resources, economic and public health shocks caused by the COVID-19 can be addressed. According to WHO, in the early stages of policy-making, to

fight the pandemic, the government should remove financial barriers (10, 11).

The present study showed a 9% reduction in the hospital's revenue. One of the reasons for this decline was the cancellation of elective surgeries and the reduction of hospital visits caused by COVID-19 (12). An essential challenge of the COVID-19 is planning capacity to treat both COVID-19 and non-COVID-19 patients (13). As the number of COVID-19 patients increases, hospitals have no option except to allocate more beds to newly infected patients, which means fewer beds available for non-COVID-19 patients (14). In the face of crises, the availability of skilled human resources is more important than access to equipment and hospital beds, and we should consider that these capacities are limited in hospitals, particularly in the public sector. The observed increase in costs can be attributed to out-of-control costs, which is a growing source. Insufficient financial resources are also because of PPE expenditures and costs of medicines to treat COVID-19 patients. The MoHME and health insurance funds should cover these costs; however, the hospital has not been reimbursed for these costs (13). Treating COVID-19 patients has increased the hospital's costs on the one hand, and cancellation of elective procedures has declined the hospital's revenue on the other. Furthermore, the sudden increase in demand for medicines, PPE, and medical supplies has increased their price (15, 16). The American Hospital Association has estimated 4 months cost of COVID-19 for US hospitals and

Table 3. Hospital's Cost Before and After COVID-19 Outbreak^a

Cost Component	Before COVID-19 (2019)		After COVID-19 (2020)		Change (%)
	Percent of Total Cost (%)	Costs (\$)	Percent of Total Cost (%)	Costs (\$)	
Human resources	68	1,678,571	48	2,021,154	+20
Medicines and medical supplies	22	535,714	29	1,224,911	+129
Non-constructive support	9	223,214	17	715,393	+220
Constructive support	1	44,643	6	267,857	+500
Total cost	100	2,482,142	100	4,208,161	+70

^aThe cost of purchasing capital equipment: Oxygen maker devices are excluded due to their long depreciation period.

health systems at \$202.6 billion (average \$50.7 billion per month) (17). As the Masih Daneshvari Hospital is the referral center for heart and lung services, along with the fact that the hospital accepts patients from all around the country, after confirming the first cases of COVID-19 in Iran, the hospital was selected as the leading center for treating patients infected with COVID-19. The observed decrease in the hospital's revenue can be attributed to reduced elective services and the lower number of transplants. Therefore, one of the main challenges of hospital managers during a pandemic is to manage hospital costs and revenues to plan, organize and manage resources to provide efficient and cost-effective services in medical centers.

5.1. Conclusions

The soaring healthcare expenditures revealed the fact that the hospital was not ready to deal with the disease. Suppose costs related to infrastructures and equipment were considered in the hospital's annual budget, particularly regarding the unique position of the hospital in coping with emerging and re-emerging diseases. In that case, such an increase in costs could be avoided. Also, the particular position of the hospital in the Middle East should be considered when developing the annual budgets. Moreover, appropriate crisis management has not been used to increase collaboration between hospitals. Using the knowledge of specialist physicians working in other hospitals and cooperating with adjacent hospitals in times of crisis (particularly the first two weeks) reduces patient hospitalization and outpatient referrals and can improve the quality of services. Further, despite having enough capacity to treat patients with other diseases, the center was fully allocated to treat COVID-19 patients, resulting in reduced revenues. As the COVID-19 outbreak grows rapidly in the country, there is a pressing need to increase medical capacities and inpatient beds to treat infected patients. Hospitals face financial problems and should be supported by the MoHME. Identifying the potential of public charities during crises would help manage and organize donations

and finance hospital needs. Motivating the society, familiarizing donors with basic hospital needs, and adjusting some standards during crises are the most critical measures to perform by senior managers. Also, predicting a hospital's needs before the onset of crises and monitoring and directing resources mobilized by donors toward hospitals are valuable measures managers can perform during crises.

5.2. Limitations

Since the financial information of hospitals is confidential, access to only a part of them requires much time due to the necessary coordination with hospital authorities.

Footnotes

Authors' Contribution: Study concept and design: M.K and M.V; Acquisition of data: B.K, M.Y, and A.A; Analysis and interpretation of data: M.Y and P.T; Drafting of the manuscript: F.Sh, R.R, M.K, and B.K; Critical revision of the manuscript for important intellectual content: M.V and R.R; Statistical analysis: M.Y, P.T, and F. Sh; Administrative, technical, and material support: A.A and R.R; Study supervision: M.K and A.V.

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