

Original Article

The Trend of Current Cost Structure in the Selected Hospitals of Isfahan University of Medical Sciences, 2011-2020

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ABSTRACT

Introduction: One of the important economic issues that arise due to limited resources and increasing costs in the health care system is the analysis of hospital costs. The aim of the present study was to investigate and compare the cost structure of the selected hospitals affiliated with Isfahan University of Medical Sciences from 2011 to 2020.

Methods: The present applied research is a descriptive type. A researcher-made checklist was used to collect the data. The cost data were obtained from accounting and financial department of each hospital. Then, the data verification process was carried out in cooperation with financial and accounting department of Isfahan University of Medical Sciences. The data were analyzed by using Microsoft Excel 2016.

Results: The results showed an increasing trend in the total cost of hospitals. The cumulative cost structure of the selected hospitals during the years under Study showed that personnel costs accounted for 55.95% of the total cost (ranging from 46.40 to 70.93%). The costs of medicine and medical consumables, which had the highest share after the personnel costs, accounted for 19.76% of the total cost (ranging from 12.98 to 33.30%).

Conclusion: Identifying the cost structure provides a correct and evidence-based insight for planning, cost management and evaluation of hospital efficiency and paves the way for hospital officials to reduce hospital costs and improve the quality of health services. Consequently, this can form the basis for informed decision-making. Considering that in the hospitals under study, a significant share of the total cost was allocated to personnel costs and medicine and medical consumables, hospital officials can pay more attention to the management of these costs and prioritize them in their planning.

Extended Abstract

Introduction

Nowadays, governments are facing the global phenomenon of increasing health sector costs. [1] A large percentage of the gross domestic product (GDP) of countries is being allocated to this sector. In 2019, 9.83% of the world's GDP and 5.32% of the GDP of low- and middle-income countries were allocated to the health sector. [2] In 2019, the share of the health sector of the GDP was 8% on average among the G20 countries. [3] In Iran, in 2019, 6.7% of the GDP was allocated to the health sector. [4] This trend of increasing costs has accelerated in developed countries as well as developing countries, and therefore, studies on cost analysis are increasing. [5] Hospitals play a vital and necessary role for the society in both developed and developing countries in such a way that they should provide health services needed by the society at an acceptable level of quality and at the lowest possible cost. [6] In addition, the World Bank study showed that the share of public sector health resources consumed by hospitals in developing countries ranges from 50 to 80 percent. [7] Thus, one of the important economic issues that arise due to limited resources, while considering the trend of increasing costs, is the analysis of hospital costs, [8] especially because hospitals need human and financial resources more than any other institutions in the health system [7], so understanding the cost structure of hospitals is essential to improve the efficiency and quality of health services. [9] Many countries, especially low- and middle-income countries, suffer from the lack of information in this field, resulting in making vague policy decisions and also increasing the costs of health services. [10,11] Some studies [7,9,12,13-22] have examined the components of hospital costs; however, they were mostly conducted with a narrow scope of one hospital or one year. Furthermore, there are few studies about the

cost structure of hospitals in Iran. For instance, the study of Kucuk [13] showed that employee payment and medicine costs had the largest share of total hospital cost both before and after COVID-19 pandemic. The total hospital cost increased by 24% after the Corona pandemic, and the cost of employee payment, the cost of medical consumables, and the cost of medicine increased by 54.5%, 1.5%, and 14%, respectively. Sikora-Alicka [12] analyzed and compared the cost structure of 20 hospitals in Poland. The costs contained salaries and wages, depreciation, consumables, energy, foreign services costs, taxes, additional costs and other costs. The results showed that despite the organizational and functional difference as well as the type of services provided in the hospitals, there was not much difference between their cost structures. Kazempour-Dizaji et al. [14] compared the cost and income, before and after the COVID-19 pandemic, in Masih Deneshvari Hospital in Tehran in 2019. The results showed that the share of personnel costs in the total hospital cost was equal to 68% before the COVID-19 outbreak, and it reached 48% after the outbreak. The share of medicine and medical consumables cost was 22% in 2019 which increased to 29% after the outbreak as well. Koushki et al. [15] consider human resource costs, medicine, medical and nonmedical consumables, depreciation, energy, food and public services (vehicle, garbage, green space, computer services, repair and maintenance) costs in their study. They found that human resource costs and medicine and medical consumables costs contributed the largest share of total hospital cost. Prinja et al. [16] evaluated the costing process in the Indian health system. The results showed that the cost of employees' salaries and wages (41%) and medicine and medical consumables (36%) had the largest share of the total hospital cost. The other components of the total cost

in this study included buildings (11%), medical consumables (5%), services (3%), overhead costs (2%) and non-consumables (1%). Chatterjee et al. [7] estimated operational costs and outpatient visit costs, cost per inpatient stay, emergency visit costs, and per surgery costs for five different hospitals in India for the financial year 2010-2011. The results showed that the cost of human resources had the largest share in regional hospitals and medical consumables had the largest share of the total cost of private and charity hospitals. In a retrospective study among Palestinian health centers in 2008 Younis et al. [17] showed that human resources, medicine and equipment accounted for the largest share of hospital cost. The study of Hammad et al. [18], Kazemi and Amirabadizadeh [19], Noori et al. [20] obtained a similar conclusion. The study of Than et al. [9] on the unit cost in two public hospitals showed that the highest cost in one of the hospitals was on medicine and human resources, respectively; but in the other hospital, equipment, medicine and consumables accounted for the largest share of the total hospital cost. In the study of Nouroozi et al. [21], hospital costs were divided into costs on manpower, depreciation, energy, consumables, and other costs (such as nutrition, transportation costs, and welfare costs). The results indicated that the highest cost was the manpower cost and the lowest cost was the consumables cost. Pakdaman et al. [22] showed that the largest share of costs in private hospitals (without capital, depreciation and equipment costs) was the cost of consumables and in teaching hospitals was the cost of human resources. The aim of this study was to identify and to compare the cost structure of the selected hospitals affiliated with Isfahan University of Medical Sciences (IUMS) over a ten-year time period, from 2011 to 2020.

Methods

The current applied research is a descriptive

study that was conducted based on the data collected from the selected hospitals affiliated to Isfahan University of Medical Sciences from 2011 to 2020. The selection was based on data availability. At first, the data were collected from financial departments of the selected hospitals after obtaining necessary permission from the vice-chancellor of research at IUMS. For data collection, a checklist (as an Excel spreadsheet) made by authors was used. The checklist was prepared based on the literature review and expert's opinion. According to this checklist, data related to hospital costs were collected and then categorized in the following categories: personnel costs including salaries, fee for services, and employer's share of insurance premium; the costs of medicine and medical consumable goods; the costs of utilities (water, gas, fuel, electricity and others); the costs of maintenance of capital goods as well as the costs of maintenance of building and other things; food costs; the costs of other contracts for the hospital supply chain; depreciation costs (depreciation cost of machinery and equipment, depreciation cost of buildings and constructions, depreciation cost of facilities and other costs of depreciation); other costs (including the cost of non-medical consumables and costs of transportation, advertising and publication). All the data have been in the form of financial balance. At the next step, the primary data collected from hospitals were checked by the financial department of the university. At this step, missing data were identified and completed as much as possible. In doing so, when necessary, the financial documents of hospitals were examined. Excel Microsoft 2016 was used for Data analysis.

Results

The increasing trend of total hospital costs is depicted in Figure 1. The growth rate of total cost of selected hospitals is shown in Table 1.

The Trend of Current Cost Structure in Hospitals

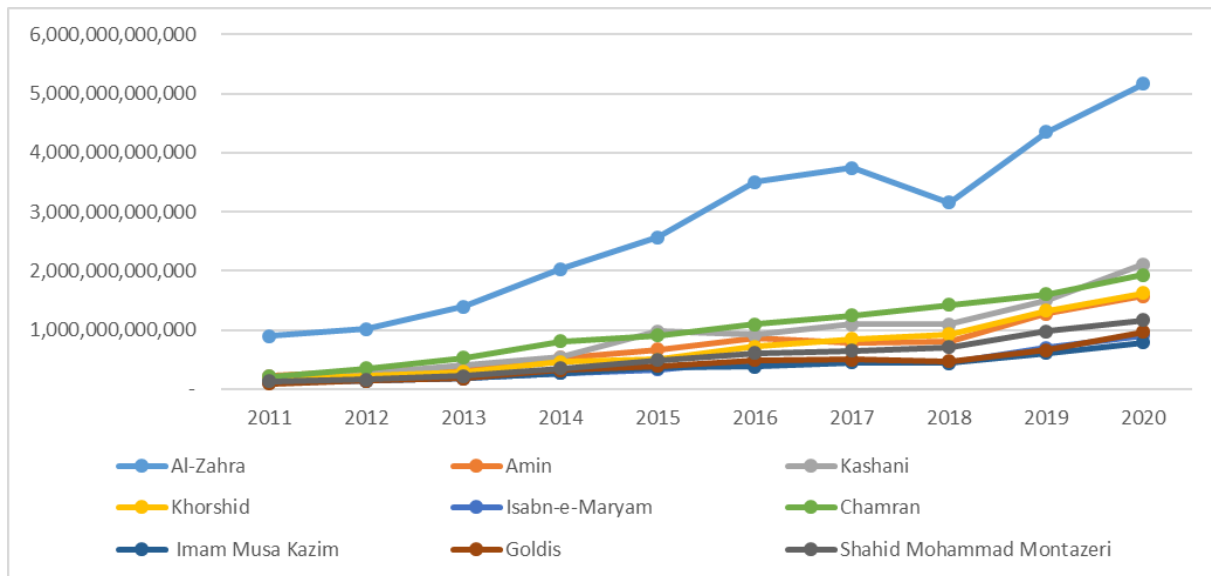


Figure 1. The trend of total hospital costs (IRR)

Table 1. The growth rate of total cost of selected hospitals (%)

Year	Al-Zahra	Amin	Kashani	Khorshid	Isabn-e-Maryam	Chamran	Imam Musa Kazim	Goldis	Shahid Mohammad Montazeri
2012	13.78	40.56	28.48	30.98	23.86	66.44	19.88	49.17	16.47
2013	36.97	13.36	52.61	34	34.25	51.69	32.01	27.54	40.89
2014	45.94	49.60	32.41	56.02	43.78	53.49	47.21	75.25	58.24
2015	26.64	25.86	81.08	8.85	25.59	12.73	31.69	21.19	40.05
2016	36.48	30.84	-5.36	44.22	42.22	20.39	3.75	27.76	24.37
2017	6.62	-10.99	19.51	17.88	-1.30	14.04	18.36	1.98	6.72
2018	-15.73	3.01	0.03	9.36	-4.89	14.35	-1.64	-7.25	8.13
2019	38.04	59.47	36.25	42.27	57.35	12.79	39.26	41.50	38.63
2020	18.82	23.97	40.75	22.55	29.09	20.38	29.69	47	19.03

As depicted in this table, except a few years, the growth rate is positive. The total cost of Al-Zahra Hospital was increasing during the years under review. In 2018, the total cost of the hospital decreased by 15.73%, which was the only case with a negative growth rate in the years of study. The highest cost growth was in 2014 (45.94%). The total cost of Amin Hospital was increasing in all years except 2017. The highest increase in the cost of this hospital was in 2019 (59.47%). A positive growth rate of costs was observed in Kashani Hospital in all years of study expect in 2016. The trend of total cost of Khorshid Hospital was increasing in all years of study and the highest cost growth was experienced in 2014 (56.02%). In 2017 and

2018, the growth of total cost of Isabn-e-Maryam Hospital was negative (-1.3% and -4.89%, respectively). This was positive in all other years with the highest growth rate related to 2019 (57.35%). The total cost of Chamran Hospital experienced a clear upward trend in the years of study with the highest growth rate in 2012 (66.44%) and the lowest in 2015 (12.73). In Imam Musa Kazim Hospital, except for the decline in the total cost growth rate in 2018 (-1.64%), the cost growth was positive in all other years of the investigation with the highest growth rate in 2014 (47.21%). In Goldis Hospital, except for the negative growth rate of the total cost in 2018 (-7.25%), the cost growth was positive in the other investigated years. The highest cost growth

was in 2014 (75.25%). The trend of the total cost of Shahid Mohammad Montazeri Hospital was upward during the study period. The highest cost growth was observed in 2014 (58.24%) and the lowest rate was observed in 2017 (6.72%). The total costs of Al-Zahra, Amin, Kashani,

Khorshid, Isabn-e-Maryam, Chamran, Imam Musa Kazim, Goldis and Shahid Mohammad Montazeri hospitals in 2020 were 5.8, 7.12, 10.2, 9.66, 8.14, 8.68, 6.7, 10.16 and 8.61 times compared to 2011 respectively. The average share of hospital costs is depicted in Figure 2.

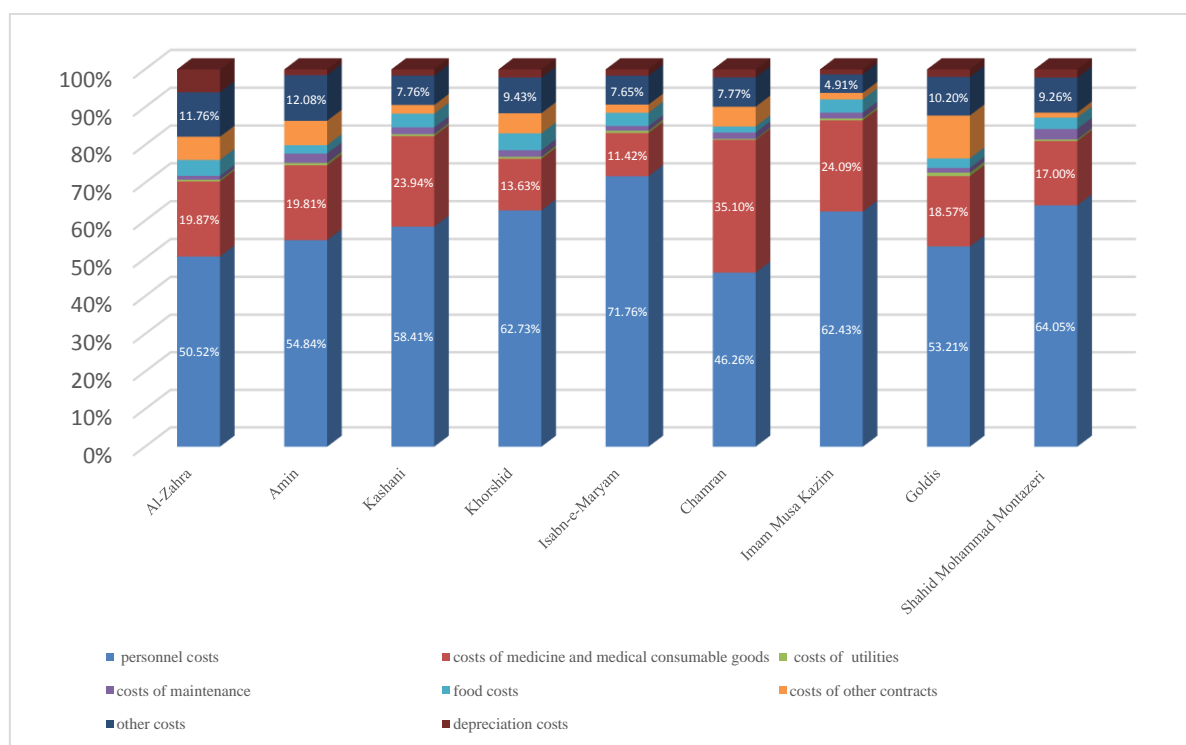


Figure 2. The average share of hospital costs (%)

During 2011-2020, on average, the highest average share of personnel costs from the total cost was related to Isabn-e-Maryam Hospital with 71.76%. After this, Shahid Mohammad Montazeri Hospital in Najafabad (64.05%) and Khorshid Hospital (62.73%) had the largest share of personnel costs respectively. After that, Al-Zahra Hospital also had the lowest share of personnel costs with an average of 50.52%. The highest average share of the cost of medicine and medical consumable goods from the total cost was related to Chamran Hospital (35.10%). After that, Imam Musa Kazim Hospital had the largest share of medicine and medical consumable goods (24.09%). The lowest share was related to Isabn-e-Maryam Hospital (11.42%), Khorshid Hospital (13.63%) and Shahid Mohammad Montazeri Hospital (17%)

respectively. The highest average share of costs of utilities from the total cost was related to Goldis Hospital (0.92). Based on the results in Figure 2, Isabn-e-Maryam and Amin Hospitals (0.6%) were placed in subsequent ranks respectively. On average, the lowest share of costs of utilities was related to Chamran (0.27%), Shahid Mohammad Montazeri (0.43%) and Al-Zahra (0.45%) hospitals. Shahid Mohammad Montazeri and Amin hospitals, showed the highest average share of maintenance costs (2.77% and 2.5%) respectively. Al-Zahra (1.01%), Isabn-e-Maryam (1.24%) and Goldis (1.25%) hospitals also had the lowest average share of maintenance costs, respectively. The highest average share of food costs from the total cost was observed in Khorshid (4.45%), Al-Zahra (4.23%) and Kashani

(3.63%) hospitals. Chamran (1.61%), Amin (2.20%) and Goldis (2.53%) hospitals had the lowest shares. The largest share of contract costs was related to Goldis Hospital (11.34%). Amin (6.44%), Al-Zahra (6.13%) and Khorshid (5.32%) hospitals were ranked next. The lowest average share was related to Shahid Mohammad Montazeri Hospital in Najafabad (1.31%), Imam Musa Kazim Hospital (1.72%) and Isabn-e-Maryam Hospital (2.14%). The average share of other costs was the highest in Amin (12.08%), Al-Zahra (11.76%) and Goldis (10.20%) hospitals, respectively. Imam

Musa Kazim (4.91%), Isabn-e-Maryam (7.65%) and Kashani (7.76%) hospitals also had the lowest average share. The average share of depreciation cost in Al-Zahra Hospital was significantly different from other hospitals (6.05%). After Al-Zahra Hospital, Shahid Mohammad Montazeri Hospital (2.17%), Khorshid Hospital (2.16%) and Chamran Hospital (2.11%) had the highest average share. Imam Musa Kazim (1.30%) and Amin (1.53%) hospitals had the lowest average share of depreciation cost. Table 2 shows the cost structure of selected hospital based on the ten-year cumulative data.

Table 2. The cost structure of the selected hospitals based on the ten-year cumulative data (%)

Hospital	personnel costs	costs of medicine and medical consumable goods	costs of utilities	costs of maintenance	food costs	costs of other contracts	depreciation costs	other costs
Al-Zahra	50.70	17.76	0.34	0.91	3.45	6.42	7.89	12.52
Amin	57.31	19	0.53	2.81	2.05	6.06	1.94	10.30
Chamran	46.40	33.30	0.25	1.65	1.82	6.02	2.62	7.94
Khorshid	62.29	13.46	0.47	1.83	4.06	6.01	2.57	9.30
Imam Musa Kazim	65.87	20.80	0.45	1.60	3.10	1.92	1.40	4.87
Isabn-e-Maryam	70.93	12.98	0.59	1.27	2.36	2.34	1.80	7.73
Kashani	60.32	22.86	0.50	1.85	3.03	2.05	1.91	7.48
Goldis	55.64	15.45	0.74	1.15	2.20	11.53	2.24	11.06
Shahid Mohammad Montazeri	65.32	16.51	0.41	3.23	2.56	1.51	2.78	7.67
Selected hospitals	55.95	19.76	0.42	1.60	2.91	5.30	4.22	9.84

The results show that personnel costs account for 55.95% of the total cost of the hospitals, ranging from "46.40-70.93%" among selected hospitals. The costs of medicine and medical consumables account for 19.76% of total cost, ranging from "12.98%-33.30%" among selected hospital which is the highest after the personnel costs. After that, other costs (9.84%) with a range of changes of (4.87%-12.52%), contracts cost (5.30%) with a range of changes of (1.51%-11.53%), depreciation cost (4.22%) with the range of changes of (1.40%-7.89%), food costs (2.91%) with a range of changes of (1.82%-4.06%), maintenance costs (1.60%) with a range of changes of (0.91%-3.23%) and

costs of utilities (0.42%) with a range of changes of (0.25%-0.74%), formed other components of the ten-year (2011-2020) cumulative cost structure.

Discussion

One of the important economic issues that arise due to limited resources and increasing costs in hospitals is the analysis of hospital costs. [8] Thus, understanding the cost structure of hospitals is essential to improve the efficiency and quality of health services. [9] The present research was conducted to investigate and compare the cost structure of the selected hospitals affiliated to Isfahan University of Medical Sciences from 2011 to 2020. The results show that, in general, the trend of total

hospital costs is increasing. The total costs of Al-Zahra, Amin, Isabn-e-Maryam, Khorshid, Kashani, Chamran, Imam Musa Kazim, Goldis, Shahid Mohammad Montazeri hospitals increased in 2020 by 5.8, 7.12, 10.2, 9.66, 8.14, 8.68, 6.7, 10.16 and 8.61 times respectively, compared to 2011. The cumulative cost structure of the selected hospitals from 2011 to 2020 shows that the personnel costs and the costs of medicine and medical consumable goods account for the highest share of the total hospital cost respectively. These findings are consistent with other studies conducted by Kucuk [13], Sikora-Alicka [12], Koushki et al. [15], Prinja [16], Hammad et al. [18], Kazemi and Amirabadi-zadeh [19], Younis et al. [17], Nouri et al. [20]. To the contrary, some studies such as those conducted by Pakdaman et al. [22] and Chatterjee et al. [7] showed that the costs of medicine and medical consumable goods account for the largest share of total hospital costs. This might be because of the fact that the hospitals they considered had different payment arrangements, not including the total personnel costs in the total hospital costs. As the results showed, the highest share of the total cost is being allocated to personnel costs and medicine and medical consumables goods. Thus,

hospital managers should pay more attention to these types of costs in their cost containment approach. A valid and reliable information system with a timely identification and record of incurred costs is very essential for that purpose. It is also important that all hospitals use an identical information system for a better comparison between hospitals. Most of the previous studies were conducted with a narrow scope of one hospital or one year. Thus, the strength of our study is its wide scope in terms of the number of hospitals investigated and the time period of the study. Also, other studies were more costing studies with the aim of calculating the unit cost, while there are few studies, particularly in Iran, in which the cost structure of hospitals has been presented. Difficulty in data collection due to the sensitivity of financial data, missing data for some years of the study period, which forced us to examine the financial documents, and non-consistency with the standard of data recording are among the limitations of this research. For a better sight to analyze hospital costs, further research could identify factors related to hospital costs, the cost structure of non-government hospitals, etc.

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