۳٠ درصد تخفیف نوروزی ویژه کارگاه‌ها و فیلم‌های آموزشی

اصول تنظیم قراردادها

پروپوزال نویسی

آموزش مهارت های کاربردی در ندوین و چاپ مقاله
The Estimation of Direct Medical Costs of Treating Patients With Chronic Hepatitis B and C in Iran

Hamid Kalantari, Majid Davari¹, Mojtaba Akbari², Seyed Mehdi Hejazi³, Maryam Kalantari⁴, Shahram Zakerin⁵, Zahra Shahshahan⁶

ABSTRACT

Background: The objective of this study is to estimate the average diagnosis and treatment costs of chronic hepatitis B and C, with respect to different therapeutic strategies in Iran.

Methods: This is a descriptive, analytical, and cross-sectional study carried out on patients with hepatitis B and C, who were referred to the Liver Disease Research Center for Prevention and Treatment of Hepatitis, Isfahan University of Medical Sciences, in 2011. We have estimated the direct medical costs including doctors’ fees, cost of para-clinical tests, medical treatments, and liver biopsy, in different treatment strategies.

Findings: The results of this study showed that the total cost of diagnostic services for hepatitis B virus (HBV) and hepatitis C virus (HCV) patients, with state medical tariffs, was US$ 1499.07 and US$ 2084.89, respectively. The patients’ profiles showed that there were currently seven therapeutic strategies available to treat HBV patients. The total cost of treatment strategies varied significantly from US$ 73 to US$ 8256. There were also four main strategies for HCV patients, each of these could be applied in two periods of time. The total cost of these treatment strategies showed a high discrepancy from US$ 242 to US$ 8256.

Conclusion: The results confirmed that the total direct medical cost for an HBV patient in Iran exceeded US$ 5.5 Milliard in 2011. The results implied that the market price of direct medical cost of HBV and HCV patients in Iran is much higher than the estimated state costs. These costs would likely be saved or reduced by effective disease management and early prevention.

Keywords: Direct medical costs, hepatitis B, hepatitis C

INTRODUCTION

Health expenditures have considerably increased worldwide in the recent decades. The Iranian healthcare system has also faced considerable challenges because of increasing its health expenditures.[1] These expenditures may have originated directly from the cost of diagnosis and treatment services of the disease or...
indirectly from loss of productivity and quality of life. Considering the limited resources for delivery of healthcare services, effective healthcare delivery is one of the general concerns of healthcare systems over the world.[2] As treatment costs are the major portion of health expenditure in many countries, recognizing and analyzing the direct treatment costs of diseases may provide health care managers with a better understanding of their financing issues and strategies.[3]

Hepatitis B Virus infection is the most widespread cause of chronic hepatitis across the world. A ten-year study of the histological variation in the liver, in 100 inactive hepatitis B cases, showed that many of inactive HBV patients would significantly transfer to chronic hepatitis,[4] that is, inactive hepatitis, may potentially deliver the risk of disease to the patients themselves, their relatives, and also other healthy people. The Hepatitis C virus affects 100 to 300 million people worldwide. Chronic HCV infection is one of the leading causes of chronic liver disease and related complications such as cirrhosis and hepatocellular carcinoma.[5,6] These two diseases, like many other chronic diseases, can impose various kinds of costs on patients and health systems worldwide.

Hepatitis B and C are two autoimmune liver diseases, which impose a high economic burden on individuals and the society in all countries.[7,8] A considerable number of studies have been published in literature, which aim to measure the economic burden of hepatitis on societies.[9,10]

The direct medical costs of the services[11] offered to patients were obtained from the official medical tariff for state-owned centers. The direct nonmedical and indirect costs of HBV and HCV were not included, because of unavailability of the data on the patients’ profiles.

RESULTS

The review of the literature, as well as patient’s profiles showed that there were some diagnostic and treatment services, which were applicable for all patients with HBV and also for patients with HCV. We have summarized these services and their costs in Tables 1 and 2 separately. As it is clear from Table 1, the total cost of diagnostic services for HBV patients was US$ 1499.07 annually. The test for detection of HBV-DNA (deoxyribonucleic acid) was the most expensive service among the diagnostic and treatment services for HBV patients.

The average total cost of diagnostic and treatment services for each HCV patient was estimated to be US$ 2084.89 per year [Table 2], which is nearly 40% higher than the estimated cost for HBV patients. Similar to HBV patients, the most expensive service for HCV patients was the test for the detection of HCV-RNA (Ribonucleic Acid).

The patient’s profiles showed that there are currently seven therapeutic strategies available
Kalantari, et al.: The direct medical costs of hepatitis B and C in Iran to treat HBV patients. The total cost of treatment strategies listed in Table 3 is related to a single patient with hepatitis B, which is based on the duration of treatment and the amount of medications used. Each of these strategies can be used as first-line treatments for HBV.\[13\]

There are also various therapeutic regimens available for treating HCV patients. These regimens are summarized in Table 4. As it is clear from the table, there are four main strategies for HCV patients, each of these could be applied in two periods of time, 24 or 48 weeks.

Although medical literature states that the first treatment choice for chronic hepatitis C is Rib+Peg IFN α2a, and the alternative regimen is Ribavirin+IFN α2b, the patients profiles show that the other therapeutic strategies used for HCV patients are Silymarin and Amantadine+Ribavirin+IFN α2b. Chronic hepatitis C is usually treated with multiple-drug regimens, but in patients with contraindications for Ribavirin, for instance those with hemolytic diseases such as thalassemia or severe anemia (Hb<10 mg/dl), Ribavirin should be omitted from the treatment regimens.

The total cost of treatment in Table 4 shows that the treatment regimens with Peg-IFN impose the highest economic burden on the society.

**DISCUSSION**

Hepatitis B and particularly C are significant diseases that could turn into chronic diseases.\[4,5\] Similar to other chronic diseases, these can impose great costs on the individuals, health insurance organizations, health systems, and as a final point, to the society.

The results of this study show that the direct medical costs of treating HBV and HCV are very high in Iran. It is particularly more important to bear in mind that these direct medical costs are estimated using state medical tariffs. However, as the price of medical services in the private sector is much higher than in the state sector, it is reasonable to conclude that the market price of treating HBV and HCV patients, and consequently the cost of treating these patients, are at least five times greater than the estimated cost using the state sector medical tariffs.

Summarizing the availability of therapeutic strategies for treating HBV patients confirmed that there are currently six active treatment protocols for...
### Table 2: Common diagnostic and treatment services and their costs for patients with chronic hepatitis C

<table>
<thead>
<tr>
<th>Health services</th>
<th>Primary G. P. visit</th>
<th>Primary para-clinical tests¹</th>
<th>Monthly clinical tests¹</th>
<th>TSH¹</th>
<th>Sonography</th>
<th>HCV-Ab</th>
<th>HCV-RNA⁴</th>
<th>Virus genotyping</th>
<th>Liver biopsy⁵</th>
<th>Pathology</th>
<th>Regular specialist visits³</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1</td>
<td>1</td>
<td>15</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>15</td>
<td>—</td>
</tr>
<tr>
<td>Cost of service (US $, state sector)</td>
<td>3.70</td>
<td>20.88</td>
<td>20.88</td>
<td>2.44</td>
<td>5.12</td>
<td>9.43</td>
<td>368.50</td>
<td>18.65</td>
<td>85.40</td>
<td>19.05</td>
<td>6.77</td>
<td>—</td>
</tr>
<tr>
<td>Total costs (US $)</td>
<td>3.70</td>
<td>20.88</td>
<td>313.20</td>
<td>9.74</td>
<td>10.24</td>
<td>9.43</td>
<td>1474.00</td>
<td>18.65</td>
<td>85.40</td>
<td>38.10</td>
<td>101.55</td>
<td>2084.89</td>
</tr>
</tbody>
</table>

¹Laboratory tests of primary screening are including CBC-diff, AST, ALT, ALP, HIV, Bil, and B-hcG tests. 
²Monthly tests in the course of treatment include CBC-diff, AST, ALT, ALP, Bil, and B-hcG. 
³TSH test is performed every 12-weeks. 
⁴Four times (before, and three months after treatment for Rapid Ventricular Response (RVR), and at the end and six months after treatment for SVR). The fee is collected from the Central Laboratory of the Tehran Blood Transfusion Organization, 2011. 
⁵The cost of biopsy includes short-term hospital admission for less than six hours, samplings (CBC, PT, PTT, and INR), tests (cross-match and blood group), biopsy taking, 22-gauge Bard biopsy needle, drugs (one 10 mg diazepam ampoule, one 1-Liter dextrose-saline, IV Lidocaine 2% ampoule), and disposable instruments (two 5-cc syringes, one angiocatheter, and one pair of surgical gloves). 
⁶Doctor’s fee for a subspecialist in the state sector.

The presented results in Table 4 also illustrate a wide range of variations in the therapeutic protocols for treating HCV infections. The differences in costs for these patients. Although this could be optimistically considered as freedom of choice for both patients and clinicians, this may also be regarded as a source of inefficient HCV management. This is particularly important considering the wide variation in costs of these strategies. As Table 3 shows, the lowest price for the Pegasis strategy is Biovudine treatment. 

**Table 3:** The summary of therapeutic procedures and its associated costs for treatment of HBV patients

<table>
<thead>
<tr>
<th>Selected therapy</th>
<th>Treatment duration (Month)</th>
<th>Single unit cost (US $)</th>
<th>Frequency</th>
<th>Total drug's cost (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFN-α2b</td>
<td>6</td>
<td>700</td>
<td>12</td>
<td>12600</td>
</tr>
<tr>
<td>Peg IFN-α2a (Pegasys⁶)</td>
<td>48 weeks (48 weeks)</td>
<td>0.20</td>
<td>0.20</td>
<td>365</td>
</tr>
<tr>
<td>Pegasys (Peg IFN-α2a)</td>
<td>48 weeks (48 weeks)</td>
<td>2.0</td>
<td>48</td>
<td>365</td>
</tr>
<tr>
<td>Pegasys (Peg IFN-α2a)</td>
<td>48 weeks (48 weeks)</td>
<td>2.0</td>
<td>48</td>
<td>365</td>
</tr>
<tr>
<td>Tenofovir</td>
<td>One Per day</td>
<td>604.80</td>
<td>12</td>
<td>7257.60</td>
</tr>
</tbody>
</table>

IFN-α2b is available in 5 million unit ampoules. It is administered as subcutaneous per day or ten million units three times a week. The treatment continues for at least one year and at least six months after the treatment is stopped. HBe-Ab becomes positive in HBe-Ag negative patients. The calculated cost in the Table is of the HBe-Ag positive patients. The calculated cost in the Table is of the HBe-Ag positive patients. The calculated cost in the Table is of the HBe-Ag positive patients. The calculated cost in the Table is of the HBe-Ag positive patients.
Thus, it seems that the effectiveness of different HBV immunization based policy regarding different HBV and HCV patients, it was recommended to undertake a cost effectiveness analysis of public vaccination against HBV and HCV in Iran.

Table 4: The summary of therapeutic procedures and its associated costs for treatment of HCV patients

<table>
<thead>
<tr>
<th>Selected therapy</th>
<th>Treatment duration (Weeks)</th>
<th>Single unit cost (US $)</th>
<th>Frequency</th>
<th>Total drug cost (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peg-IFN α2a+Rib¹</td>
<td>24</td>
<td>172.00</td>
<td>Once a week</td>
<td>4128.00</td>
</tr>
<tr>
<td>IFN+Rib²</td>
<td>48</td>
<td>4.65</td>
<td>Thrice a week</td>
<td>8256.00</td>
</tr>
<tr>
<td>IFN+Rib+ Aman</td>
<td>24</td>
<td>4.71</td>
<td>Thrice a week</td>
<td>669.60</td>
</tr>
<tr>
<td>Silymarin³</td>
<td>24</td>
<td>0.16</td>
<td>630 mg per day</td>
<td>241.92</td>
</tr>
<tr>
<td>(Single therapy)</td>
<td>48</td>
<td></td>
<td>(9 tablets)</td>
<td>483.84</td>
</tr>
</tbody>
</table>

¹Peg-IFN α2b is available in the following dosage forms: (a) 50 μg vials, (b) 80 μg vials, (c) 100 μg vials, and (d) 120 μg vials. The price of the medicine (each vial) is US $95, out of which US $ 66.5 is paid by the insurance companies and the remaining US $ 28.5 is paid by the patient. ²The dosage of Ribavirin in virus genotypes 3 and 4 is calculated to be four capsules per day; and in genotypes 1 and 4 the dosage is considered to be five or six capsules per day, depending on the body weight. ³This treatment regimen does not usually use a standard treatment in therapeutic centers; but in the Omid Hepatitis Treatment and Research Center, PEG Isfahan, is used for research purposes.

The difference between the lowest price protocol, 24 weeks Silymarin utilization, and the highest price protocol, 48 weeks combination therapy with Peg-IFN α2a+Rib, is more than 34 times [Table 4].

Taking into account the fact that the cost of diagnostic services is identical for all therapeutic strategies, it is certainly reasonable to evaluate whether the clinical outcomes associated with these protocols are worth their costs.

With regards to both diagnostic and therapeutic costs, the average direct medical costs for each HBV patient per year is estimated to be US $3668 with the state medical tariffs. Although there is no accurate figure of HBV patients in Iran, some studies suggest that the population with HBV in Iran was around 1.5 million, in 2008. Therefore, the total direct medical cost of HBV patients in Iran could be expected to be higher than US $5.5 Milliard, in 2011, considering the state medical tariffs. Likewise, the average direct medical cost for each HCV patient, per year, is estimated to be US $3976. Regarding the fact that the population with HCV in Iran is estimated to have been 120 thousand in 2008,[14] the total direct medical cost of HCV patients in Iran is nearly US $0.5 Milliard in 2010; with state medical tariffs.

The results of this study may encourage clinicians and health policy makers to think more about the most cost-effective therapeutic strategies for managing HBV and HCV patients and also to consider preventive strategies, which may possibly provide better value for money for managing hepatitis in Iran.

Hajarizadeh et al., carried out a study to determine the costs of a hepatitis B immunization program in juveniles, in 2006-2007. The cost of each vaccine inoculation was determined to be almost $2.10.[15] Comparing the costs of HBV and HCV management, the immunization cost was considered small. However, as vaccination must cover the whole population and not only the patients, it was recommended to undertake a cost effectiveness analysis of public vaccination against HBV and HCV in Iran.

Although there are several studies evaluating the cost-effectiveness of different HBV immunization strategies worldwide,[16-19] many of them used uncertain HBV-associated costs.[20] Thus, it seems necessary to undertake a further study, to collect a more comprehensive and detailed cost analysis of the HBV and HCV patients in Iran. The results of such studies could include direct and indirect costs of medical and nonmedical services for hepatitis patients. These studies may help health policy makers to undertake a more accurate and evidence-based policy regarding different HBV and HCV immunization strategies in Iran.

CONCLUSION

This study provides useful information on the cost of various treatment protocols for HBV and HCV patients in Iran. The results implied that the market price of the direct medical cost of HBV and HCV patients in Iran is much higher than the estimated state costs. The study also showed that there are considerable variations in the costs of various therapeutic strategies, which encourage the evaluation of clinical outcomes, as well as economic costs of these protocols. The results can also be useful in the future cost-effectiveness analysis of these different treatment protocols as well as preventive strategies for hepatitis in Iran.
REFERENCES


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