



Economic burden of inpatients with viral hepatitis B-related diseases and the influencing factors

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Abstract

Objective: The purpose of this study was to analyze the economic burden of inpatients with hepatitis B virus (HBV)-related diseases and the influencing factors so as to provide an effective basis for the development of health prevention and control strategies.

Methods: The patients were selected by means of successive sampling in the period between August and December 2012 from those who were diagnosed with HBV-related diseases and hospitalized in county-level medical institutions of Jiangsu Province. One hundred ninety-six patients were studied, including 3 patients with acute HBV, 141 with chronic HBV, 18 with compensatory cirrhosis, 22 with decompensated cirrhosis, and 12 with liver cancer. This study adopted a questionnaire method to investigate and calculate the direct and indirect economic burden of the subjects according to disease economic burden theories and methods. Multiple linear stepwise regression was used for analysis of the influencing factors for economic burden of inpatients with HBV-related diseases.

Results: The average economic burden for the 196 inpatients investigated was RMB 28,971. The direct economic burden was RMB 19,916 (68.7%), including direct medical costs (RMB 19,087; 95.8%) and direct non-medical costs (RMB 829; 4.2%). The indirect economic burden was RMB 9055 (31.3%), including patient-related expenses (RMB 6348; 70.1%) and nursing expenses (RMB 2707; 29.9%). According to the multiple linear stepwise regression analysis results, the hospital stay, proportion of medicine, age, and disease type affected the economic burden of the patients ($P < 0.05$).

Conclusion: Patients with HBV-related diseases undertake a heavy economic burden for hospitalization, especially the direct economic burden. Therefore, the inpatients' economic burden can be reduced by shortening the hospital stay, reducing the medical expenses reasonably, and delaying the progression of disease as far as possible according to medical standards.

Keywords: Hepatitis B, Economic burden, Influencing factor, Hospital stay, Medical expenses, Progression of disease

Introduction

Hepatitis B is an infectious disease caused by hepatitis B virus (HBV) infection that primarily harms the liver. Due to the high morbidity and long duration of infection, hepatitis B not only endangers patient health, but also creates

a heavy burden on society and patients' families [1–3]. Therefore, it is necessary to study the economic burden of patients with HBV-related diseases and the influencing factors. This study was conducted on inpatients hospitalized in county-level medical institutions

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in a comprehensive pilot program for prevention and control of major infectious diseases in Jiangsu Province. By analyzing the direct and indirect economic burden and discussing the level of burden and influencing factors, the basis for development of prevention and control strategies will be provided.

Subjects and methods

Subjects

The data contained in this article was collected from the comprehensive pilot program for the prevention and control of major infectious diseases in Jiangsu Province. One hundred ninety-six patients were selected by means of successive sampling in the period between August and December 2012 from those who were diagnosed with HBV-related diseases and hospitalized in county-level medical institutions of Jiangsu Province, including patients with acute HBV, chronic HBV, compensatory cirrhosis, decompensated cirrhosis, and pre-invasive liver cancer, but excluding patients with toxic, drug-induced, and autoimmune hepatic diseases.

Investigation content

Questionnaires were designed according to the requirements of theories and methods relating to economic burden of disease, and taking in consideration of the actual status of HBV-related diseases. The investigation included characteristics of demography, family income, medical security, and health service utilization and expenses. Economic burden included direct economic burden and indirect economic burden. The former refers to the sum of direct medical and direct non-medical costs, including the current hospitalization cost and the expenses for self-purchased medicines during the hospitalization period, while the latter refers to the expenses spent on accommodations and transportation for the purpose of obtaining medical treatment. Indirect economic burden refers to the loss of labor time due to hospitalization and the loss of labor time of others for nursing, including patient and nursing expenses. The calculation formula was as follows: days lost \times Jiangsu GDP per capita in 2012 \div 365.

Quality control

When the design of the questionnaire was initially completed, experts were invited to evaluate the content and make

revisions, then a pre-investigation was organized to review the questionnaire items and the investigation process. An official investigation was conducted by trained investigators. This questionnaire investigation was carried out with informed consent.

Statistical methods

The statistical processing used statistical software 19.0. The multiple linear stepwise regression method was used to analyze the influencing factors of the economic burden of inpatients with HBV-related diseases. A $P < 0.05$ showed the difference was statistically significant.

Results

General information

Among the 196 patients, 142 were males (72.4%) and 54 were females (27.6%); the subjects were 21–75 years of age and the average age was 45.1 ± 11.8 years. Three of the patients (1.6%) had acute HBV, 141 (71.9%) had chronic HBV, 18 (9.2%) had compensatory cirrhosis, 22 (11.2%) had decompensated cirrhosis, and 12 (6.1%) had liver cancer. With respect to the medical security type, 2 patients (1.0%) had free medical services, 90 (45.9%) had basic medical insurance for urban employees, 22 (11.3%) had basic medical insurance for urban residents, 71 (36.2%) had new rural cooperative medical insurance, 1 (0.5%) had a comprehensive arrangement fund for serious disease, and 10 (5.1%) were at their own cost.

Economic burden of inpatients with HBV-related diseases

The average hospital stays were as follows: inpatients with HBV-related diseases, 34 d; patients with acute HBV, 49 d; patients with chronic HBV, 36 d; patients with compensatory cirrhosis, 32 d; patients with decompensated cirrhosis, 26 d; and patients with liver cancer, 25 d. The average annual family income was RMB 60,966 and the current hospitalization economic burden was RMB 28,971 on average, including direct economic burden (RMB 19,916; 68.7%) and indirect economic burden (RMB 9055; 31.3%). The ratio of direct economic burden-to-indirect economic burden was 2.2:1. Among the direct economic burden, the direct medical cost was RMB 19,087 (95.8%) and the direct non-medical cost was RMB 829



(4.2%), indicating a ratio of 23.0:1 of direct medical cost-to-direct non-medical cost. Among the indirect economic burden, the patient expenses were RMB 6348 (70.1%) and the nursing expenses were RMB 2707 (29.9%), indicating a ratio of 2.3:1 of patient expenses-to-nursing expenses. The average economic burden each time was higher for patients with acute HBV, chronic HBV, and liver cancer. The daily average economic burden was RMB 852. The burden for patients with liver cancer was the highest, followed by the burden for patients with decompensated cirrhosis. Table 1 shows the economic burden of patients with different HBV-related diseases.

Analysis on the factors influencing the economic burden of inpatients with HBV-related diseases

Economic burden data had a skewed distribution and was processed by designating the hospitalization economic burden logarithm as the dependent variable, and the gender, age, marital status, economic conditions, medical security form, disease type, anti-viral treatment, suffering from other diseases, hospital stay, and medicine proportion as the independent variables (Table 2). The medical security form and disease type were dummy variables, the entry criterion was an $\alpha=0.05$, and the removal criterion was an $\alpha=0.10$. The adjusted coefficient of determination was a $R^2=0.65$, indicating a good explanation of the regression equation. Based on multi-collinearity analysis, the variance inflation factor was (VIF) <5 , indicating there was no multi-collinearity. As shown by the multiple linear stepwise regression analysis results, the hospital stay, proportion of medicine, age, and disease type affected the economic burden of patients with HBV-related diseases (Table 3).

Discussions

Hepatitis B is a worldwide epidemic and China is an endemic area with high HBV infection. As shown in the results of this study, males with an average age of 45.1 years constituted the majority of inpatients with HBV-related diseases, which is consistent with the results of Li and others [4]. This result may be caused by the social habits of men, most of whom have unhealthy habits, which will increase the incidence of HBV. The average hospital stay of patients in this investigation was 34 d. Based on patients with different types of diseases, we showed that the hospital stay of patients with chronic HBV was the longest, whereas the hospital stay of patients with liver cancer was the shortest. This result may be related to the conservative treatment of inpatients with liver cancer. As shown by the results of this study, the average inpatient hospitalization economic burden of patients with HBV-related diseases was RMB 28,971, while the average annual income of the investigated families was RMB 60,966. The average inpatient hospitalization economic burden consumed one-half of the annual income of such families. The ratio of direct economic burden-to-indirect burden of patients with HBV-related diseases was 2.2:1, and the ratio of direct medical cost and direct non-medical cost was 23.0:1. The expense structure was different for patients with different diseases, e.g., the economic burden was higher for patients with liver cancer, although the average hospital stay was the shortest. The average daily economic burden of patients with liver cancer was the highest and that of patients with decompensated cirrhosis was the second highest. The study showed that the average inpatient economic burden per time and the average daily economic burden of those

Table 1. Economic burden of patients with hepatitis B-related diseases (Yuan)

Disease type	Direct economic burden			Indirect economic burden			Average inpatient economic burden	Average daily economic burden
	Direct medical cost	Direct non-medical cost	Total	Patient expenses	Nursing expenses	Total		
Acute hepatitis B	22,829	191	23,020	9175	1685	10,860	33,881	691
Chronic hepatitis B	19,569	958	20,527	6726	2827	9554	30,081	836
Compensatory cirrhosis	15,206	459	15,665	6013	1706	7719	23,384	731
Decompensated cirrhosis	17,361	419	17,780	4775	3302	8077	25,857	994
Liver cancer	21,474	780	22,254	4588	1950	6538	28,792	1152
Average	19,087	829	19,916	6348	2707	9055	28,971	852



Table 2. Assignments for the influencing factors of economic burden of inpatients with HBV-related diseases

Variable	Assignment
Gender	Male: 1, female
Age	Actual value
Marital status	Married=4, single=0
Economic conditions	Poor=1, common=4, good=3 Public health service=1; basic medical insurance for urban residents=2; basic medical insurance for urban employees=3; new rural cooperative medical system=4; comprehensive arrangement for serious diseases=5; own cost=6
Medical security form and disease type	Chronic hepatitis B=0; compensatory cirrhosis=1; decompensated cirrhosis=2; liver cancer=3; acute hepatitis B=4
Anti-viral treatment	Yes=1; No=4
Suffering from other diseases	Yes=1; No=4
Hospital stay	Actual value
Medicine proportion	Actual value

Table 3. Multiple stepwise regression analysis on the influencing factors of economic burden of inpatients with HBV-related diseases

Factor	Variable	β	Standard error	β'	t value	P-value
Constant	X0	3.752	0.133	–	28.233	0.000
Hospital stay	X1	0.010	0.001	0.777	16.752	0.000
Medicine proportion	X2	0.146	0.031	0.218	4.666	0.000
Age	X3	0.003	0.001	0.139	2.915	0.004
Disease type (contrast to chronic hepatitis B)						
Compensatory cirrhosis	X4	–0.100	0.044	–0.103	–2.256	0.025
Decompensated cirrhosis	X5	0.029	0.041	0.033	0.706	0.481
Liver cancer	X6	–0.038	0.052	–0.033	–0.735	0.463
Acute hepatitis B	X7	0.040	0.098	0.018	0.410	0.683

with HBV-related diseases was high when the direct economic burden made a great contribution. Reduction of direct medical costs was the key to relieve the economic burden. The average inpatient cost per time and the average daily economic burden of patients with liver cancer was heavier, and controlled disease progression is one of the ways to relieve the social burden.

Overseas and domestic studies have shown that the hospital stay, age, medicine proportion, disease progression, medical security form, level of medical institutions, marital status, and other factors may affect the economic burden of patients with hepatitis B diseases [5–9]. As determined through multiple linear stepwise regression analysis in this study, the hospital

stay, medicine proportion, age, and disease type were the main factors for the economic burden of hospitalization, and the hospital stay was the most important factor. This was consistent with the results of the study conducted by Chen et al. [6]. The longer the hospital stay, the higher the expenses were. Such expenses included bed cost, as well as diagnosis and treatment cost. Therefore, patients' economic burden could be reduced by shortening the hospital stay reasonably to improve social benefits. The hospital stay of the patients investigated in this study was >1 month on average, depending on the disease features and also related to insufficient compensation for outpatient expenses. Whether or not outpatient treatment occupies



hospitalization should be determined. We also discovered that the medicine proportion was an influencing factor for the economic burden of inpatients with HBV-related diseases. This was possibly because the treatment of hepatitis B needs expensive antiviral drugs and liver protective drugs. Therefore, to reduce direct medical cost and economic burden effectively, reasonable control measures of the medicine proportion must be taken and more medicines integrated to the public medical security system. It was also discovered that age was an influencing factor for the economic burden, which was consistent with the findings of Shi [7] and Li et al. [8]. This may be because the possibility of complications would increase with age. The finding that disease type was an influencing factor of hospitalization economic burden was consistent with the results of Chen et al. [6]. However, fewer patients with acute HBV were involved in this study, which might affect the analysis. In this study, we did not demonstrate an influence of gender, marital status, and medical security form on the economic burden, and this result was consistent with other international and domestic studies [7, 9].

In conclusion, in Jiangsu Province patients with HBV-related diseases are undertaking a heavy economic burden, especially a direct economic burden. Therefore, a reasonable reduction of hospital stay and control of medicine cost and disease progression are helpful for reducing the economic burden from diseases. This study was insufficient because the samples were from county-level medical institutions in the pilot area without information from medical institutions above the county level. This may result in an underestimation of the economic burden of inpatients with HBV-related diseases and insufficiency of sampling number may affect the analysis results. In the future, inpatients in medical institutions at different levels may be studied and the sample size may be expanded for evaluation of the economic burden and influencing factors more comprehensively.

Contributions of the theme personnel: Hua Zhang was mainly responsible for data collection, sorting, and analysis, preparation of the manuscript, and subsequent modification; Professor Pei Liu was mainly responsible for study conception and modification of the first draft; Vice Professor Jianqian

Chao was mainly responsible for study design, site coordination, and modification of the first draft; Liguozhu was mainly responsible for site organization and modification of the first draft; Long Song was mainly responsible for site implementation and data collection; and Xiyan Li was mainly responsible for data sorting and statistical analysis.

Conflict of interest

The authors declare no conflict of interest.

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