



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.

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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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