Analysis on Medical Expenses of Hypertensive Inpatients in Urban Areas from 2010 to 2013—Evidence from Two Provinces in South of China*

He WANG[1], Min SU[1], Peng-qian FANG[1, 2#], Juan XU[1#]
[1]*School of Medical and Health Management, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430030, China*
[2]*School of Health Policy and Management, Nanjing Medical University, Nanjing 211166, China*

Summary: Along with the development of society and the rapid economic growth in the past decades, hypertension and other chronic diseases have become important reasons for people's poverty caused by illness in China. This study collected a total of 5857 people from 2010 to 2013 randomly from the database of the Medical Insurance Department (MID), including 3229 people in Hubei province and 2628 people in Guangdong province. One-way ANOVA was used to compare the total medical expense, out-of-pocket (OOP) expense and hospital stay between variables. A multiple linear regression analysis was done to identify possible risk factors of total medical expense. The results showed that the average total medical expense per capita was 5709.89 yuan, and the medical expense per capita was 7053.58 and 4555.97 yuan in Guangdong province and Hubei province, respectively. The medical expense of hypertensive inpatients decreased from 7222.32 yuan in 2012 to 4894.66 yuan in 2013. There were no significant differences in medical expenses between different genders of hypertensive patients (P>0.05). People of different ages, provinces, medical insurances and medical institution levels showed significant differences in medical expenses. The government should increase the investment in chronic disease management and treatment in the central and western regions to narrow the gap with the eastern region. Medical insurance fund payment should be improved to ensure the fairness of the use of medical services in different medical insurances. And measures should be taken to encourage chronic patients to visit primary medical institutions to effectively reduce medical expenses.
Key words: hypertension; medical insurance; medical expense; economic burden

Along with the development of society and the rapid economic growth in the past decades, people's living standard has been improved and aging of population is becoming more and more serious. As a developing country, the prevalence of chronic diseases of China is increasing rapidly with the rapid aging of population. In addition, China has been undergoing tremendous demographic and epidemiological transitions[1], and the disease spectrum has changed significantly in China. Chronic diseases gradually replaced infectious diseases, becoming a major threat to people's health. There are many kinds of chronic diseases, such as hypertension, diabetes, cancer and so on. At present, the morbidity of chronic diseases is high, and each chronic disease is often accompanied by other three or more chronic diseases[2]. Studies have shown that there are now 260 million patients with chronic diseases confirmed and 85% of all deaths were attributed to chronic diseases in 2013 in China[3], which brought great healthcare challenges to China[4].

As a common chronic disease, the prevalence of hypertension is very high and keeps growing year by year. According to the WHO Global Status Report on

He WANG, E-mail: wanghehust@hust.edu.cn
#Corresponding authors, Peng-qian FANG, E-mail: pfang@mails.tjmu.edu.cn; Juan XU, E-mail: xujuan@hust.edu.cn
*This project was supported by Key projects of National Natural Science Foundation of China (No.71333005).

Non-communicable Diseases in 2014, hypertension is a major risk factor for global mortality, causing about 9.4 million deaths each year[5]. Moreover, studies showed that hypertension was a major determinant of cardio-cerebrovascular disease and a serious global public health problem[6–8]. In China, the prevalence of hypertension in adults was 18.8% in 2002. Only 10 years later, the prevalence of hypertension in adults rose to 25.2% in 2012. Among them, the prevalence of hypertension in elderly people aged 60 and above was even up to 58.9% in 2012. Among the adults with hypertension, less than half knew their diagnosis and only 41% received treatment for hypertension[9, 10].

The rapid growth of health expenditure has become a worldwide problem, especially in China. According to the WHO report, the per capita health expenditure in China was $43 in 2000 and it rose to $274 in 2011, with a growth rate of 537.21%[11]. Hypertension and related chronic diseases are not only a serious threat to people's health, but also bring heavy economic burden to people worldwide, because of long-term treatment and medication[12, 13]. In China, 70% of total disease economic burden was attributed to chronic diseases. Studies showed China's medical and health system reform expanded the coverage of health insurance from 2009, but most costs of outpatient clinic visits and medications still needed individual payment[14, 15]. Even in other countries with universal healthcare coverage, chronic diseases still produced huge and increasing out-of-pocket (OOP) expense. A health spending statistic for California (USA) showed that chronic diseases cost $98 billion every year, accounting for 42% of health spending across the continent. Besides, a number of studies showed that, in Australia, chronic disease brought people high OOP expense[16, 17], with average annual rate of growth of 30% from 2007 to 2010, which accounted for almost a quarter of total health expenditure[18, 19]. In South Korea, studies showed that people with chronic diseases were more likely to bring catastrophic health spending to households[20] and the insurance had poor effect on reducing the OOP[21].

In order to reduce the economic burden of patients with hypertension, the Chinese government has implemented a number of policies. First of all, there are three kinds of medical insurances in China to share medical expenses for hypertensive patients: the Urban Employee Basic Medical Insurance (UEBMI), the Urban Resident Basic Medical Insurance (URBMI) and the rural New Cooperative Medical Scheme (NCMS). In order to ensure the fairness of urban and rural residents, URBMI and NCMS are being integrated into one system, called the Urban and Rural Resident Basic Medical Insurance (URRBMI)[22]. Secondly, China established chronic outpatient clinics at primary medical institutions, and put it into the scope of medical insurance, which has played an important role in reducing the economic burden of hypertensive patients. Last but not the least, in order to reduce the drug expenses, China implemented the Essential Drug System. For essential drugs in the catalogue, the government would ensure a cheap and affordable price through price negotiation and funding, and drugs would be sold at hospitals for no profit[23, 24]. Many hypertension treatment drugs are included in the list of essential drugs.

Hypertension and other chronic diseases have become important reasons for people's poverty caused by illness in China. If not been timely and effectively controlled, it will bring serious social and economic problems. Although many measures have been taken by Chinese government, people with hypertension still have a heavy economic burden of disease. In this paper, we drew data from hypertensive inpatients service of Guangdong province and Hubei province from 2010 to 2013 and try to explore the differences and effects on the medical expense.

1 MATERIALS AND METHODS

1.1 Data Source

According to the geographical position and economic development level, the National Bureau of Statistics divides China into eastern, central and western regions, with 11, 8 and 12 provinces, respectively. Guangdong province is one of the eastern provinces with a per capita GDP of 58833 yuan in 2013, and Hubei province is in the central region with a per capita GDP of 42826 yuan in 2013. This study selected Guangdong province and Hubei province, from the eastern and central regions of China, respectively, as our study areas. In addition, Guangdong province and Hubei province are both located in south of China, which could avoid unnecessary deviation in the results because of great differences between the north and south of China, such as climate, lifestyle, diet structure and so on.

The data of this study were collected from the database of the Medical Insurance Department (MID). According to the regulation in China, the information and expense data of patients with medical insurances in all medical institutions should be sent to local MID regularly to set up the databases. We chose the hypertensive inpatients from the databases of Guangdong MID and Hubei MID from 2010 to 2013, and sorted them by the patient's hospitalization number each year and each province. Then the data were randomly selected by systematic sampling with a sampling interval of 20, which means we picked 1 person every 20 persons each year and each province. As a result, a total of 6324 hypertensive inpatients were selected from the two provinces. After deleting invalid samples with incomplete information or inconsistent

data, there were a total of 5857 patients in this study, including 3147 patients from Hubei province and 2710 patients from Guangdong province. The data included basic information of patients, hospital stay, total medical expenses, OOP expense, etc.

1.2 Definition of Some Concepts

In the study, hypertension was defined as those with systolic blood pressure ≥140 mmHg, or diastolic pressure ≥90 mmHg, or use of antihypertension medications[13].

The total medical expense in this study refers to the total direct medical cost for hypertension and its complications during hospitalization in the medical institutions. Therefore, we does not discuss the cost for comorbidities with hypertension and the indirect costs, such as transportation expenses, loss of working time and so on during hospitalization.

OOP expense refers to the fees which need patients to pay by themselves, and it equals to the total medical expense minus the medical insurance fund expense. Therefore, the OOP expense is the cost that will not be reimbursed from the medical insurance OOP expense can reflect the patient's economic burden of hypertension actually.

1.3 Statistical Analysis

SPSS 21.0 statistical software was used to perform statistical analyses. The general data of the subjects were analyzed descriptively. One-way ANOVA was used to compare the total medical expense, OOP expense and hospital stay between groups of different province, age, gender, medical insurance and medical institution level. A P value of less than 0.05 was considered statistically significant. The logarithmic transformation of the cost data guarantees the data to be normal distribution. Then, a multiple linear regression analysis was done for total medical expense to identify possible risk factors.

2 RESULTS

2.1 Patients' Demographics

The 5857 hypertensive inpatients in our study were from two provinces and four years. Among them, the males accounted for 55.1% (3229) and the females accounted for 44.9% (2628). The males were a little more than the females in both provinces. Most of the patients were elderly, and only 16.6% of them were less than 45 years old. The patients in our study all had a basic medical insurance. Totally, 4157 (71.0%) patients purchased UEBMI and 1700 (29.0%) patients purchased URBMI. The proportion of patients with UEBMI in Hubei province was slightly higher than that in Guangdong province. As for the choice of medical institutions, most hypertensive patients in Guangdong province chose secondary hospitals, but most patients in Hubei province chose to visit tertiary hospitals. The total medical expense per capita in Guangdong province and Hubei province was 7053.58 and 4555.97 yuan, respectively. Detailed patients' demographic characteristics are shown in table 1.

Table 1 Demographic characteristics of patients in Guangdong and Hubei provinces

Characteristics	Overall	Guangdong	Hubei
*Total	5857 (100.0)	2706 (46.2)	3151 (53.8)
*Year			
2010	1372 (23.4)	550 (9.4)	822 (14.0)
2011	1407 (24.0)	629 (10.7)	778 (13.3)
2012	1577 (26.9)	825 (14.1)	752 (12.8)
2013	1501 (25.6)	702 (12.0)	799 (13.6)
*Gender			
Male	3229 (55.1)	1408 (24.0)	1821 (31.1)
Female	2628 (44.9)	1298 (22.2)	1330 (22.7)
*Age			
18−44	970 (16.6)	400 (6.9)	570 (9.7)
45−64	2942 (50.2)	1126 (19.2)	1816 (31.0)
≥65	1945 (33.2)	1180 (20.1)	765 (13.1)
*Medical insurance			
URBMI	1700 (29.0)	728 (12.4)	972 (16.6)
UEBMI	4157 (71.0)	1978 (33.8)	2179 (37.2)
*Medical institution level			
Primary medical institutions	1529 (26.1)	764 (13.0)	765 (13.1)
Secondary hospitals	1995 (34.1)	1049 (17.9)	946 (16.2)
Tertiary hospitals	2333 (39.8)	893 (15.2)	1440 (24.6)
**Hospital stay (days)	10.26 (6.94)	12.03 (8.77)	8.74 (4.31)
**Total medical expense (Yuan)	5709.89±6149.29	7053.58±7439.35	4555.97±4459.72
**MI fund expense (Yuan)	4072.07±4534.05	5207.99±5576.58	3096.58±3074.44
**OOP expense (Yuan)	1637.82±2221.43	1845.59±2679.58	1459.39±1714.40

*Results are expressed as numbers (%). **Results are expressed as $\bar{x}\pm s$. The expenses were calculated at current prices.

2.2 Expenses of Health Service

Table 2 showed the average medical expenses, OOP expenses and hospital stay of hypertensive inpatients. The average hospital stay was 10.62 days, and total medical expense and OOP expense per capita were 5709.89 and 1637.82 yuan, respectively. The results showed that hospital stay, total medical expense and OOP expense all differed significantly between different provinces, years, medical insurances and medical institution levels (P<0.05), but all of them showed no significant differences between the genders (P>0.05). Besides, Patients of different ages had significant different hospital stay and total medical expense (P<0.05). For the change trend of the annual average expenses for hypertensive inpatients from 2010 to 2013, the total medical expense and OOP expense both increased firstly and then decreased, peaking at 2012.

Table 2 Average expenses and hospital stay of health service

	Hospital stay (days)	Total medical expenses (yuan)	OOP expense (yuan)
Total	10.26±6.94	5709.89±6149.29	1637.82±2221.43
Province			
Guangdong	12.03±8.77	7053.58±7439.35	1845.59±2679.58
Hubei	8.74±4.31	4555.97±4459.72	1459.39±1714.40
*P-value	<0.001	<0.001	<0.001
Year			
2010	11.07±7.54	5299.99±5502.37	1615.82±2376.88
2011	9.08±4.55	5284.13±5397.37	1372.81±1811.78
2012	11.20±8.93	7222.32±8047.58	2019.99±2832.62
2013	9.63±5.46	4894.66±4605.22	1504.81±1535.20
*P-value	0.004	<0.001	<0.001
Gender			
Male	10.43±7.49	5708.28±6159.16	1605.44±2250.71
Female	10.04±6.20	5711.88±6138.31	1677.60±2184.69
*P-value	0.736	0.982	0.216
Age (years)			
18–44	10.18±7.03	5879.91±6909.42	1679.33±2594.62
45–64	10.62±7.17	5962.81±6196.70	1679.47±2359.11
≥65	9.75±6.50	5242.54±5629.35	1554.11±1754.80
*P-value	0.007	<0.001	0.126
Medical insurance			
URBMI	9.04±6.45	5287.88±6161.01	1866.36±2946.28
UEBMI	10.76±7.07	5882.47±6136.87	1544.36±1836.99
*P-value	<0.001	<0.001	<0.001
Medical institution level			
Primary medical institutions	10.46±8.09	5183.77±5478.28	1390.35±1559.70
Secondary hospitals	10.88±7.48	5666.24±5547.40	1552.52±2141.23
Tertiary hospitals	9.59±5.42	6092.03±6974.88	1872.95±2603.05
*P-value	0.004	<0.001	<0.001

Results are expressed as $\bar{x}\pm s$. *One-way ANOVA was used. α=0.05. The expenses were calculated at current prices.

To rule out possible confounding effects, total population was stratified by provinces to further observe the expense changes between different groups of ages. The results are shown in table 3. The results in Hubei province showed that total medical expense and OOP expense both increased with age. However, the medical expenses of patients over 65 years old in Guangdong province decreased significantly, and the hospital stay was obviously shortened.

In order to observe the expense changes in Guangdong province and Hubei province, respectively, the expense in the two provinces were analyzed separately. The change tendency of medical expenses in the two provinces was quite different (fig. 1). First of all, expenses were much higher in Guangdong province than in Hubei province. Secondly, the changes of the total medical expense in Guangdong province were similar to the trend of the overall expense (table 2), while the trend of the expenses in Hubei province was stable. Finally, the total medical expense and OOP expense of the two provinces were getting close by 2013.

Table 4 shows the multiple linear regression results of total medical expense of Guangdong province and Hubei province. Because the total medical expense was skewed distribution, the logarithmic transformation of total medical expense was used as the dependent variable. We chose the age, medical insurance, medical institution level and year as independent variables, because those

factors showed significant influence on total medical expenses in the One-way ANOVA. Dummy variables were set for age, medical institution level and year, and the first group of each variable was the reference group. The result showed that age, medical insurance, medical institution level and year were important influencing factors for total medical expense in both provinces. However, the total medical expense showed no significant differences between primary medical institutions and secondary hospitals in Guangdong province, between years of 2010 and 2011 in Hubei province, between age of 0–40 and above 65 in both provinces.

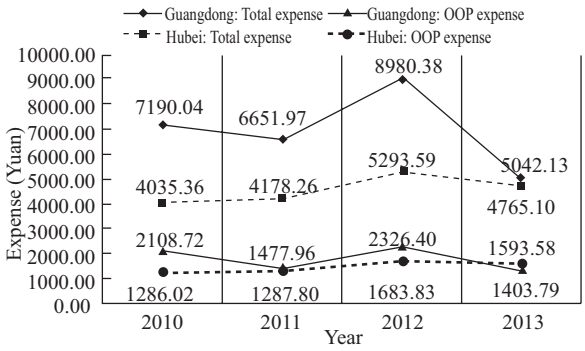

Fig. 1 Comparison of expenses between two provinces from 2010 to 2013

Table 3 Average expenses and hospital stay stratified by province and age

Ages (years)	Hospital stay (days)	Total medical expense (Yuan)	OOP expenses (Yuan)
In Guangdong			
18–44	13.52±9.37	8217.92±9785.80	2071.34±3783.08
45–64	14.41±9.38	8376.05±7928.97	2070.65±3081.15
≥65	9.24±6.98	5396.95±5450.00	1554.31±1555.93
*P-value	<0.001	<0.001	<0.001
In Hubei			
18–44	7.84±3.04	4239.19±2758.64	1404.23±1115.78
45–64	8.27±3.79	4466.50±4171.33	1436.93±1726.25
≥65	10.52±5.59	5004.36±5891.01	1553.80±2024.70
*P-value	<0.001	0.003	0.200

Results are expressed as $\bar{x}\pm s$. *$\alpha = 0.05$. The expenses were calculated at current prices.

Table 4 Multiple regression model of total medical expenses

Province	Model	Unstandardized Coefficients		Standardized Coefficients	t	P-value
		B	S.E.	Beta		
Guangdong*	Medical insurance	0.090	0.014	0.118	6.523	<0.001
	Age# (years)					
	45–64	0.031	0.018	0.045	1.694	0.090
	≥65	−0.141	0.018	−0.206	−7.732	<0.001
	Medical institution level ##					
	Secondary hospitals	0.008	0.015	0.011	0.526	0.599
	Tertiary hospitals	0.074	0.015	0.102	4.759	<0.001
	Year ###					
	2011	−0.041	0.018	−0.051	−2.213	0.027
	2012	0.101	0.017	0.137	5.837	<0.001
	2013	−0.118	0.018	−0.152	−6.499	<0.001
Hubei**	Medical insurance	0.065	0.012	0.100	5.624	<0.001
	Age# (years)					
	45–64	0.005	0.014	0.009	0.382	0.703
	≥65	0.040	0.017	0.057	2.411	0.016
	Medical institution level ##					
	Secondary hospitals	0.065	0.014	0.100	4.509	<0.001
	Tertiary hospitals	0.072	0.013	0.119	5.406	<0.001
	Year ###					
	2011	0.015	0.015	0.022	1.009	0.313
	2012	0.119	0.015	0.169	7.983	<0.001
	2013	0.077	0.015	0.111	5.240	<0.001

*R Square is 0.153; **R Square is 0.045. #Reference group is 18–44; ##Reference group is of primary medical institutions; ###Reference group is 2010. α=0.05

3 DISCUSSION

Results from our study show that the demographic characteristics of hypertensive inpatients in Guangdong province and Hubei province were significantly different. In terms of gender, the males were more than the females both in Guangdong province and Hubei province, which is in accordant with previous research that the prevalence of hypertension was higher in males than the females[25]. As for the age, most hypertensive patients were over 45 years old. It showed that middle-aged and elderly people are more likely to suffer from chronic diseases because of their poor body function. However, previous study found that the average age of patients with hypertension and other chronic diseases is decreasing[26]. Compared with Guangdong province, the hypertensive inpatients in Hubei province were younger. It may be related to the high salt diet in Hubei province, as high salt diet is now considered a major cause of hypertension[27].

Previous study reached conclusions that expense of hypertension increases with age[28]. As hypertensive patients get older, the possible relative complications and comorbidities would lead to increase of the medical expenditure[29]. Wang also found that the proportion of households with elder members has no direct relationship with catastrophic health expenditure (CHE)[30]. But our study draws different conclusions about the effect of age on the expense of hypertension. Data from Hubei province confirm the results above, but they are different in Guangdong province. The medical expenses of patients over 65 years old in Guangdong province decreased significantly, and the hospital stay was obviously shortened. The possible reason is that community health centers are better in Guangdong province than in Hubei province, therefore the elderly patients with stable condition can go to health center for treatment, resulting in the reduction of hospitalization expenses.

In this study, the total medical expenses of Chinese hypertension inpatients fluctuated, reaching the top in 2012 and significantly decreasing in 2013. The possible reasons are as follows: Firstly, in 2012, China carried out the County Public Hospitals Reform[31], setting up designated medical institutions for chronic disease, in order to encourage chronic disease patients to visit primary medical institutions. Our study and previous studies all showed medical services in primary medical institutions are proved to be much cheaper[32, 33]. Secondly, Many hypertensive drugs were included in the catalogs of Essential Drug and Basic Medical Insurance, also helped hypertensive patients to reduce the cost of treatment and OOP expense[29, 30, 34]. Moreover, combining the medical expenses with the hospital days in 2010–2013, we found that Chinese government controlled the medical expenses mainly by shortening the hospital stay.

Further comparing the expenses of the two provinces, the total medical expense and OOP expense were higher in Guangdong province than in Hubei province. Official reports also have shown the differences in medical expenses between eastern, central and western China, and the eastern was the highest and the western was the lowest[9, 35]. Guangdong province is located in eastern China, where the economy is more developed and people have a higher living standard than Hubei province. They have higher medical needs and are willing to accept better and more expensive medical services. Besides, for the same medical services or drugs, the price in Guangdong province could be higher, due to the higher consumption levels. However, the OOP ratios (OOP expense/total medical expense), in Hubei province were higher than that in Guangdong province, which means the basic medical insurance of Guangdong province has a higher payment ratio.

Previous study found that there were significant differences in hospitalization expenses among hypertensive patients with different medical insurances[36]. In 2013, the Fifth National Health Survey showed that the average hospitalization expense for urban employee (10761 yuan) was 1.62 times that of urban residents (6653 yuan)[37], which was consistent with the results of this study. This result showed the unfairness of the use of health resources between patients with different medical insurances. Different medical insurances have different policies, which would result in different medical behavior for doctors and different consumer behavior for patients. In the composition of the medical expenses, the medical insurance fund paid more than patients, which would probably lead to excess demand of medical service of patients. In addition, for doctors, due to the pursuit of more income and profits, high medical insurance fund expense may induce over-medical behavior and result in more medical expenses[38].

There were significant differences in the hospital stay, total medical expense and OOP expense at different levels of medical institutions. The higher the medical institution level, the higher the total medical expense and OOP expense. The result was consistent with previous studies[32, 33]. First of all, it is well known that the higher level medical institutions have more medical resources and better medical service abilities to provide more and better medical services for patients, resulting in the great expenses for patients. Secondly, the insurance policies encourage patients to visit primary medical institutions for medical treatment by setting a higher reimbursement ratio, resulting in a low OOP expense. It's worth noting that the tertiary hospitals had the highest medical expense but the shortest hospital stay. The reason may be that, in recent years of China, patients prefer to go to the tertiary hospitals for medical

treatment, leading to overcrowding of hospital and shortage of hospital bed. Therefore, the government has implemented a number of measures to control the average hospital stay in tertiary hospitals and improve the turnover rate of hospital beds.

There are several limitations in this study. Firstly, the expense of hypertensive inpatients in this study only included direct medical expenditure in hospital, and the indirect health expenditure data were unavailable. Therefore, the true financial expenditure of hypertensive inpatients may be underestimated[39]. Secondly, it is regrettable that Guangdong province and Hubei province in this study only represent the eastern and central China, repectively. In the next study, we will conduct a study in the western region, to get a more comprehensive understanding of China's overall situation of the expense of hypertensive inpatients. Thirdly, only hypertensive inpatients were investigated in this study because their conditions were more serious. In the next study, we plan to conduct further investigations for the hypertensive outpatients or patients of drugstores.

The results of this study show that the rising trend of medical expenses of hypertensiive inpatients in China was well controlled from 2010 to 2013. However, there are significant differences in the medical expenses of hypertension patients between different ages, provinces, medical insurances and different levels of medical institutions. Therefore, the government should increase the investment in chronic disease management and treatment in the central and western regions to narrow the gap with the eastern region. Besides, the medical insurance fund payment of URBMI should be improved to ensure the fairness of the use of medical services in patients with different medical insurance. Last but not the least, measures should be taken to encourage chronic patients to visit primary medical institutions for outpatient treatment and long-term medication when the condition is not serious, so as to effectively reduce medical expenses.

Acknowledgements

The authors of the paper are grateful to the Guangdong MID and Hubei MID for their support in the data collection.

Conflict of Interest Statement

The authors of this paper declare they have no conflict of interest.

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(Received Oct. 24, 2017; revised May 20, 2018)