

Correlation between compliance in patients with anti-hypertensive therapy and blood pressure control

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Abstract: This paper aims to understand the blood pressure control status for hypertension patients, and discuss the relationship between social support, medication compliance and blood pressure for hypertensive patients. The survey objective was the hypertensive patients in chronic disease management system in Xinxiang city. The survey was conducted as the questionnaire survey filled by objectives. Social support rating scale and medication therapy compliance questionnaire was utilized to evaluate the patients' social support and medication therapy compliance. 1095 patients in medication were investigated, the blood pressure of 66.6% investigated objectives was controlled at target levels (<140/90 mmHg), 70.0% investigated objectives have good medication therapy compliance; the overall social support score for hypertensive patients in medication was (40.01±6.54) points, the subjective support score, objective support score and support utilization degree score were respectively (24.43±4.61) points, (8.59±2.59) points and (7.00±2.06) points; Rank correlation coefficient of Spearman illustrated that the support utilization rating evaluation was apparently correlated to medication therapy compliance ($r_s=0.88$, $P<0.01$); multivariate analysis proved that the protective factors for medication therapy compliance were the high support utilization rate (OR 1.62; 95% CI 1.19~2.05), long hypertensive duration (5~10 years: OR 2.01, 95% CI 1.42~2.73; more than 10 years: OR 1.46, 95% CI 1.01~1.99) and high average monthly household income (OR 2.03, 95% CI 1.45~2.69); Risk factor for blood pressure control were male (OR 0.61, 95% CI 0.47~0.79) and high hypertensive grade (OR 0.31, 95% CI 0.19~0.44); The protective factors for blood pressure control was good medication therapy compliance (OR 1.54, 95% CI 1.22~1.89), (average $P<0.05$). It required to build effective social support system, increase patients' social support utilization degree, emphasized the intervention on low average monthly household incomes, male higher rate, higher hypertensive degree, and further improve the medication therapy compliance and hypertensive control rate of hypertensive patients.

Keywords: Hypertension; blood pressure control; social support; medication therapy compliance.

INTRODUCTION

Hypertension is one of the most significant worldwide public health problem. It is not only the most common chronic disease, but the most main risk factors on cardio-cerebrovascular disease (Kearney *et al*, 2005; Chmiel *et al*, 2012). In China, the hypertensive population present a rising tendency. It is estimated that there will be at least 200 billion hypertensive patients. Furthermore, the overall awareness rate, treatment rate and control rate of Chinese hypertensive patients are obviously lower than other countries, which are respectively 50%, 40% and 10% (Writing Group of 2010 Chinese Guidelines for the Management of Hypertension, 2011). The control measurement for hypertension are mainly medication therapy and lifestyle intervention. Although the existed anti-hypertensive medication could decrease the blood pressure of at least 90% hypertensive patients to normal level, the blood pressure control condition is not satisfactory. The main reason is the widely existed bad compliance in patients with anti-hypertensive therapy

(CPAT), which is still a big public health challenges (Munger *et al*, 2007; Ning *et al*, 2012). Under the modern biology-psychology-social medicine model, the psychosocial factors attracted more and more attention. As the intermediary factor of social psychological stress, the significance of social support had substantiated effect to buffer social pressure, control disease, improve prognosis and elevate patients' life quality (Ding *et al*, 2005). This study studied the relationship between blood pressure condition and social support and CPAT, in order to provide evidence for hypertension effective control.

MATERIALS AND METHODS

Objective investigation

The objective resource was form the database of hypertensive patients who had received chronic disease system management from September 2015 to December 2015. Simple random sampling method was performed among 15 communities through inclusion criteria and exclusion criteria. The inclusion criteria: Firstly, age shall not less than 18 years old, no gender requirements; secondly, primary hypertensive patients included in

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chronic non-epidemic disease system management. Exclusion criteria: firstly, combined with other physical disease, such as cerebral apoplexy, diabetes, tumor, thyroid disease, *et al*; secondly, patients with family history of psychosis and clear psychosis disease; thirdly, patients who could not properly answer questions due to physical disability and cognitive impairment.

Investigation method and content

Cross-sectional survey research method was applied to finalize the investigation based on informed consent. Investigation objectives shall fill the questionnaire. For patients who could not fill the questionnaire, the investigation shall be finalized by well unified trained investigators through face to face method. Questionnaire included following 5 terms.

CPAT scoring

Hypertensive patients CPAT questionnaire (Morisky) was applied to evaluate the hypertensive patients CPAT, which had good reliability and validity (Dai *et al*, 2000; Morisky *et al*, 1986; Xu *et al*,). It included 4 questions: 1) Did you have the experience that you forgot to take medicine? 2) Did you sometimes do not pay attention to take medicine? 3) Did you stop taking medicine when you felt the self-conscious symptom become better? 4) Did you stop taking medicine when you felt the self-conscious symptom become worse? If the answer for the above four question all were "No", the medication therapy compliance was good; if even one answer of above four question was "Yes", the medication therapy compliance was bad. CPAT scores were calculated according to the answer of above questions, the answer of "Yes" was 1, the answer of "No" was 0. The higher the scores, the poor the medication therapy compliance.

Social support condition

The adopted Social Support Rating Scale included 10 items: positive support, also named the patient felt or emotional support; objective support, also named the actual support that patients received; support utilization degree, which reflected the individual multiply social positive utilization, which included 3 aspects (talking, seeking help and attending activities). The higher the overall scores and each aspect, the higher the support degree. The mean score was divided, below the mean score represented the low social support, above mean score showed high social support.

Social demographic characteristics of investigation objectives

The investigated matters were age, gender, marriage condition, education degree, occupation, monthly average household incomes, etc.

Hypertensive disease condition

It included hypertension disease course, hypertension

grading, whether taken the medicine, and so on. Blood pressure control rate = the measured hypertension-controlled (<140/90mmHg, 1mmHg = 0.133kPa) patients cases quantity in this survey/overall quantity of hypertensive patients in this survey $\times 100\%$. Hypertension diagnosis and classification standard was based on 2010 Chinese guidelines for the management of hypertension (Xiao *et al*, 1994). The diagnostic criteria were below, in the condition without taken anti-hypertensive medicine, the systolic pressure not less than 140 mmHg and/or diastolic pressure not less than 90mmHg; patients had hypertensive history, and with anti-hypertensive medicine was still diagnosed with hypertension, even if blood pressure was less than 140/90 mmHg. Classification standard: hypertension was further divided into stage, stage 2 and stage 3 based on hypertension level. Hypertension stage 1 was that systolic pressure was 140~159 and/or diastolic pressure was 90~99 mmHg; hypertension stage 2 was that systolic pressure was 160~179 and/or diastolic pressure was 100~109 mmHg; hypertension stage 3 was systolic pressure not less than 180 and/or diastolic pressure not less than 110mmHg.

Blood pressure measurement method

The standard desktop mercury sphygmomanometer was adopted. The participants were required not to take coffee or wine 30 min before the measurement, attend strenuous exercise activities, and empty the bladder, and sit and rest quietly for 5~10 min. According to clinic blood pressure measurement, the blood pressure were detected 3 times continuously, with at least 1~2 min. If three times of measurement results difference was big (more than 5 mmHg), it need to measure again. Took the average value of the three times (Working group for blood pressure measurement in China, 2011).

STATISTICAL ANALYSIS

Epidata3.1 was used to establish the database. SPSS18.0 software was utilized to input, check and quality control the relative statistical analysis. Measurement data was marketed by $\bar{x} \pm s$. Detection was represented by t and χ^2 . Spearman rank correlation was employed to analyze the relationship between social support and CPAT score. Non-conditional logistic regression was adopted to study the multiply factors analysis. $P < 0.05$ was marked for the statistical different significance.

RESULTS

Social demographic characteristics

The sample size of this epidemiological investigation was 1268 cases, among which there were 1126 cases, accounting for 88.8%. The study objectives were the 1095 cases who were taking the medication with complete profile and the blood pressure were well controlled. Among the 1095 cases, there were male 507 cases,

Table 1: Relationship between the social demographic characteristics and blood pressure control rates

Feature		Cases	Constituent ratio (%)	Blood control [cases (%)]	χ^2 value	<i>P</i> value
Gender	Male	507	46.3	347(68.4)	16.587	<0.001
	Female	588	53.7	382(65.0)		
Age (years old)	<45	18	1.6	13(72.2)	1.994	0.483
	45~<55	119	10.9	77(64.7)		
	55~<65	406	37.1	280(67.0)		
	65~<75	343	31.3	215(62.7)		
	≥75	209	19.1	144(68.9)		
Marriage condition*	Married, non-divorced	968	88.4	646(66.7)	2.683	0.467
	Unmarried, divorced, spouses loss	127	11.6	83(65.4)		
Education degree*	Illiteracy	144	13.1	88(61.1)	7.869	0.132
	Primary school	279	25.5	195(69.9)		
	Middle school	344	31.4	231(67.2)		
	High school (technical secondary school)	221	20.2	149(67.4)		
	College, university (junior college), or above	107	9.8	66(61.7)		
Occupation	Professional technical people	177	16.2	114(64.4)	6.834	0.278
	National institute or enterprise legal person	33	3.0	23(69.7)		
	Clerk	64	5.8	41(64.1)		
	Business person	92	8.4	66(71.7)		
	Service staff	122	11.1	78(63.9)		
	Farming, animal husbandry and fishing staff	257	23.5	176(68.5)		
	Workman	289	26.4	189(65.4)		
	Other	61	5.6	42(68.9)		
Average monthly household income* (RMB)	≤1500	245	22.4	163(66.5)	1.887	0.484
	>1500~3000	657	60.0	445(67.7)		
	>3000	193	17.6	121(62.7)		

Note: * referred to have absent patients who were not included in the analysis.

accounting for 46.3%, female 588 cases, accounting for 53.7%; age was from 36 to 85 years old, average (64.8±6.5) years old. 729 cases of investigation objectives blood pressure were controlled at target level (<140/90 mmHg). The univariate analysis results stated that the blood pressure control rate in different gender of investigation objectives were different ($P<0.01$), as seen in table 1.

Characteristics of hypertension

There were 426 cases with hypertension disease course more than 10 years, accounting for 38.9%, 347 cases with 6~10 years of disease course (31.7%). 322 cases with less than 5 years old (29.4%); 655 cases were in hypertension stage 1 (59.8%), 119 cases were in hypertension stage 2 (10.9%); univariate analysis results showed that it was mutually correlated relationship between hypertension disease course, hypertension classification and blood pressure control rate ($P<0.01$), as seen in table 2.

Social support condition

The overall social support scores was (40.01±6.54) score for the 1095 cases of investigation objectives. The three dimension average scores for subjective support, objective support and support utilization degree were respectively (24.43±4.61) scores, (8.59±2.59) scores and (7.00±2.06) scores. The univariate analysis results illustrated that the investigation objective support utilization degree was related to whether blood pressure was controlled. The support utilization degree for patients who well controlled the blood pressure was higher ($P<0.05$), as shown in table 3.

Relationship between CPAT and blood pressure control rate

766 cases of investigation objectives had good CPAT, among which there were 528 cases (68.9%) of investigation objectives with blood pressure controlled at normal level. In patients with bad CPAT, there were 201 cases (61.1%) of investigation objectives with blood

Table 2: The relationship between hypertension disease features and blood pressure control rates

Hypertension		Cases	Constituent ratio (%)	Blood control [case(%)]	χ^2 value
Disease course (year)*	≤5	322	29.4	230(71.4)	13.819
	>5~10	347	31.7	244(70.3)	
	>10	426	38.9	255(59.9)	
Classification*	Stage 1	655	59.8	449(68.5)	24.768
	Stage 2	119	10.9	64(53.8)	
	Stage 3	40	3.7	16(40.0)	
	Unknown	281	25.7	200(71.2)	

Note: * referred to have absent patients who were not included in the analysis.

Table 3: The relationship between social support and blood pressure control condition

Whether blood pressure was controlled or not	Cases	Overall social support scores	Subjective support	Objective support	Support utilization degree
Yes	729	40.13±6.67	24.48±4.73	8.56±2.60	7.09±2.08
No	366	39.89±6.05	24.37±4.69	8.61±2.50	6.91±1.97
<i>t</i> value		1.358	1.321	-0.156	2.014
<i>P</i> value		0.186	0.214	0.064	0.039

Table 4: The correlation between CPAT and blood pressure control rates

CPAT	Cases	Constituent ratio (%)	Blood pressure control [cases (%)]	χ^2 value	<i>P</i> value
Good	766	70.0	528(68.9)	6.014	0.011
Bad	329	30.0	201(61.1)		

Note: CPAT referred to compliance in patients with anti-hypertensive therapy. * referred to with 2 cases of investigation objectives CAPT data absent.

pressure controlled at normal level. Cases with good CPAT had better blood pressure control rate ($P < 0.05$), as seen in table 4.

Correlation between social support and CPAT

Based on features of data distribution, correlation analysis were performed on the social support and CPAT condition of investigation objectives. Spearman correlation analysis showed that support utilization degree was apparently correlated to CPAT ($r_s = 0.88, P = 0.005$). In order to avoid the mutual interaction between factors, the social support, general information and disease condition of investigation objectives were also included, and analyzed by multivariate Logistic regression analysis with CPAT as the dependent variable (1 for good, 0 for bad). The results was shown in table 5. The results stated that the support utilization degree, hypertension disease course and average monthly household incomes were the impact factor for CPAT ($P < 0.05$).

Multivariate factor analysis on CPAT, social support and blood pressure control condition

Blood pressure control index was set as the dependent variable (1 for yes, 0 for no) for multivariate non-conditional logistic regression analysis. The involved dummy variable analysis set female, non-divorced, illiteracy, average monthly household incomes not less than 1500 RMB, hypertension stage 1, low social support

and bad CPAT as the reference group. The results showed the male and high hypertension classification were the risk factor for blood pressure control. Good CPAT was the protective factor for blood pressure control. Details were shown in table 6.

DISCUSSION

In developing countries, the change of aging population, urbanization and social economic condition caused the ever increasing of hypertension prevalence. At the same time, blood pressure control rate was still in a low level (Erdine *et al*, 2004). Low blood pressure control rate increased the risk of cerebral apoplexy and other cardiovascular and cerebrovascular disease, especially for Asian people (He *et al*, 2012), which seriously impact on people’s health level and quality of life. So, it was significant to positively study the impact factors of blood pressure control.

In this investigation, the blood pressure control rate of hypertension patients was 66.6%, which was higher than the blood pressure control rate in 2010 (41.5%), and also in a higher level in domestic level, compared to other regions (Qian *et al*, 2010; Zhou *et al*, 2010; Li *et al*, 2009; Wu *et al*, 2010; Meng *et al*, 2011); the ratio of investigation objective good CPAT was higher (70.0%), which was obviously higher than the investigation results

Table 5: CPAT mutivariate non-factor Logistic regression analysis

Impact factors	Classification	B value	Standard error	χ^2 value	P value	OR value	95%CI
Support utilization degree	Low					1.00	
	High	0.450	0.147	10.578	0.003	1.62	1.19~2.05
Hypertension disease course (years)	≤ 5					1.00	
	>5~10	0.684	0.176	14.873	<0.001	2.01	1.42~2.73
	>10	0.371	0.168	4.568	0.036	1.46	1.01~1.99
Average monthly household income (RMB)	≤ 1500					1.00	
	>1500~3000	0.581	0.176	10.987	0.002	1.81	1.30~2.38
	>3000	0.737	0.228	11.297	0.001	2.03	1.45~2.69

Table 6: Multivariate non-conditional Logistic regression analysis of social support, CPAT and blood pressure control condition

Risk factor	Classification	B value	Standard error	χ^2 value	P value	OR value	95%CI
Gender	Female					1.00	
	Male	-0.538	0.138	15.098	<0.001	0.61	0.47~0.79
Hypertension classification	Stage 1					1.00	
	Stage 2	-0.547	0.209	7.083	0.008	0.60	0.41~0.82
	Stage 3	-1.085	0.358	9.118	0.003	0.31	0.19~0.44
CPAT	Bad					1.00	
	Good	0.389	0.142	6.987	0.009	1.54	1.22~1.89
Support utilization degree	Low					1.00	
	High	0.143	0.129	0.997	0.335	1.19	0.95~1.35

Note: CPAT referred to compliance in patients with anti-hypertensive therapy.

in 2005 (31.1%) (Dai *et al*, 2005). It intimately related to preferred communication management on chronic disease with high blood pressure in recent years, ever optimizing and developing of management system and the positive comprehensive prevention and intervention research.

This investigation analysis results showed bad CPAT patients had lower blood pressure control rates. At the same time, the increasing of patients' hypertension severity and lower blood pressure control rates indicated the significance of health education and guidelines for hypertensive patients, further understand the enhance on CPAT significance. It shall ever improve its compliance and practice during the treatment and fundamentally improve the blood pressure control level. This investigation results showed that the female blood pressure control rate was lower than female, male support utilization degree score was lower than female ($t=11.17$, $P=0.001$). The analyzed reason might be related to traditional culture attached more responsibility, pressure, independence and persistence on male. When male had encountered pressure and difficulties, they need to bear it by themselves. This tendency was unfavorable to solve the problem, may caused negative emotional feelings, even impact on health level (Xue *et al*, 2011). When female encountered problems, they were more inclined to talk and expose the feelings, so as to seek comfort and help, and positively attend some community activities in order to actively achieve and fully use the support, then

could increase the stress level, have a favorable impact on health, can more effectively control blood pressure.

CONCLUSION

This investigation analysis results showed that the support utilization of investigation objectives was apparently associated with CPAT, the higher the support utilization, the better the CPAT. The reason might be that patients positively seek and make full use of all kinds of discussion, help method to effectively withstand all kinds of negative social stress source and to eliminate unhealthy factors, then to truly benefit from that, and form and maintain health, so the CPAT was higher. Multi-factor analysis indicated subjective support and objective support was not the effect factor of CPAT and blood pressure control. Due to the transformation of modern medical model, social support impact on psychosomatic disease had attracted more and more public attention. Xinxiang city had formed a good supportive environment through practice. The practical guidance had performed to guide and intervene patients' psychological health. So the actual support and the subjective accepted support were relatively increased. However, it still had difference with support utilization. Thus, it affected CPAT level. In addition, the longer the hypertension disease course and higher the average monthly household incomes, the higher the CAPT value. The patients with higher average monthly household incomes had more stable economic

support on the medication therapy. Patients could insist on therapy treatment, thus the CPAT was higher. In conclusion, it required to build the effective social support system, improve patients' social support utilization degree, pay attention to intervene the patients with short hypertension disease course, low average monthly household incomes and male and high hypertension classification, and improve patients' CPAT, in order to achieve better blood pressure control rate.

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