Application of ordinal cumulative odds logistic regression model to analyze the influencing factors of quality of life in patients with epilepsy in rural Henan Province, China

HAN Xiong[1, 2], CHANG Liang[3], ZHENG Meiqiong[2], SONG Bo[1], TAN Song[1], MIAO Wang[1], WANG Ruihao[1], Chandra Avinash[1], LIU Xiaojing[1], XU Yafang[1], XU Yuming[1]

[1] Department of Neurology, First Affiliated Hospital of Zhengzhou University, 450052, Zhengzhou, China
[2] Department of Neurology, Henan Provincial People's Hospital, 450003, Zhengzhou, China
[3] Henan Province Centre of Disease Control, 450003, Zhengzhou, China
xuyuming@zzu.edu.cn

Abstract: Purpose: To investigate and analyze the various factors influencing the quality of life in patients with epilepsy. Methods: QOLIE-31, CES-D, SAS were used to measure multiple indexes of the study population, and multivariate ordinal cumulative logistic regression model was used to conduct univariate and multivariate analysis on the quality of life and its influencing factors among patients with epilepsy. Results: Among the 874 patients with epilepsy, the median score of the 4 different levels of QOL was 28, 44, 67, and 78 respectively. The major influencing factors of QOL among patients with epilepsy were seizure frequency, awareness rate of knowledge on epilepsy, anxiety, depression, types of medication intake and compliance. Among these, high seizure frequency, concomitant anxiety and depression were risk factors of QOL, and high awareness rate of knowledge on epilepsy, single-medication intake and good compliance were protective factors of QOL. Conclusions: The findings highlight the necessity to lay stress on intervening the modifiable influencing factors in special patients with epilepsy. Carrying out targeted health promotion and psychological intervention therapy, along with single medication intake are of vital importance to improve the QOL of patients with epilepsy. This cumulative odds logistic model is of scientific effectiveness.

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Epilepsy is a common disease that seriously harms people's health and increases the incidence of organic and mental diseases. It not only brings great suffering to the patients, but also increases the disease burden of the patients' families, the individual and the society. Awareness rate of the knowledge on epilepsy was transformed by the score of the related questionnaires. Scores of the QOL were transformed from numerical variables to the categorical variables (binary,0 and 1; polytomous: 1,2,3,…k) because they could not meet the tests of homogeneity of variance and normality, replying that different levels of QOL have orders and grades.

Ordinal cumulative odds logistic regression (Armstrong and Sloan, 1989; Brant, 1990) was a useful tool when the variables were polytomous and ordinal. In order to understand the QOL and its influencing factors in patients with epilepsy, in August 2011, we used multi phase stratified random sampling method to collect related research data in 9 exemplary sites, and conducted questionnaires survey among 900 patients with epilepsy. Multivariate cumulative odds logistic regression model was used to analyze the QOL and its influencing factors in patients with epilepsy, in order to provide basic data for targeted health promotion, epilepsy prevention and treatment.

1. Data and Methods

1.1 Study population: Since 2005, in 9 exemplary sites located in Mengzhou City and Xiuwu County of Jiaozuo City, Yancheng District, Huiyuan District, Wuyang County, Linying County, Zhaoling District of Luohe City, Xinye County and Fangcheng County of Nanyang City, 4.26 million rural people were screened and reexamined for generalized tonic-clonic seizure. After reexamination and diagnosis by well-trained neurologists, the eligible patients were enrolled in the project management and were administered standard therapy, individualized health education, psychological intervention therapy and follow-up. Comprehensive intervention group members were sampled randomly in the 5218 patients in the phenobarbital comprehensive management group, and the non-intervention control group members were sampled in the confirmed epilepsy patients who were not enrolled in the comprehensive group (diagnosed after reexamination and enrolled in the phenobarbital group). There was no statistical significance in the difference of age, gender,

profession and economic status among these two groups. Inclusion and exclusion criteria were in accordance with the Implementation scheme of epilepsy prevention, treatment and management project in rural China (Guiding group of epilepsy prevention, treatment and management project in rural area, Buerau of Disease Control, Ministry of Health. 2010; Office of the national epilepsy project 2011).

1.2 Questionnaires: 1. The QOLIE-31 scale (Cramer and etc., 1998; Liu Xueqin and etc., 2003) consists of 7 items: (1) Seizure worry, SW; (2) Overall Quality of life, Overall QOL; (3) Emotional well-being, EW; (4) Energy/fatigue, EF; (5) Cognitive functioning, CF; (6) Medication effects, ME; (7) Social functioning, SF. Scoring rules: Numeric values for responses to QOLIE-31 scales are devised so that higher and lower scores reflect better HRQOL and worse HRQOL and use ranges of values from 1 to 100. To account for these differences, the scoring system requires conversion from raw, precoded numeric values to scores of 0-100 points, with higher converted scores always reflecting better HRQOL. Converted scores for items in each scale that were answered to determine the Scale Score (range 0-100 points). The total score is not a simple sum or mean of the seven subscales. An overall score can be calculated by weighting and summing the product of QOLIE-31 scale scores times its weight and summing over all scales using an empirically derived coefficient to weight and sum scores. 2. The Center for Epidemiological Studies Depression Scale (CES-D) (Roberts and Vernon, 1983; Zhang Mingyuan, 1998) , it consists of 20 items, and it is evaluated by the frequency of related events and feelings in the previous week, the score ranges from 0-3, with higher score indicating more severe depression symptoms. 3. The Self-rating Anxiety Scale (SAS)(Zhang Mingyuan, 1998; Zung WW, 1971), it consists of 20 items, the score ranges from 1 to 4, with higher score indicating more severe anxiety symptoms. 4. General social demographic and other disease related questionnaires.

1.3 Methods of investigation: A combination of centralized survey and household survey was adopted. Investigators were acted by rigorously trained and qualified professional technical personnel. After informed consent was obtained, the investigators presented the questions to the interviewees and filled in the questionnaires according to their answers, and each visit lasted about 20 minutes. If the interviewee could not answer or could not correctly answer some questions (due to illiteracy, mental retardation, or aphasia, etc.), it was assessed according to the observation from his/her family members, guardians, nurses and other insiders. After completion, the questionnaires were carefully reviewed by the inspectors.

1.4 Statistical analysis: Epidata 3.0 software was used on the dual- independent data input, and R 2.10.0 was used for data processing and analysis, the statistical significance level of test was set at $\alpha = 0.05$. Cumulative odds logistic regression model was used to conduct univariate and multivariate analysis on the influencing factors (inclusion criterion was set at 0.05, and exclusion criterion was set at 0.10). Quality of Life (QOL) was divided into 4 levels (level 1, level 2, level 3 and level 4) according to the cut-off points: low (p25), intermediate (p50) and high (p75).

2. Results

2.1 Questionnaires survey: A total of 1642 patients received the survey, after exclusion of incomplete or ineligible questionnaires, 900 questionnaires were retrieved, and 847 questionnaires were enrolled finally. The qualifying rate was 97.1%.

Reliability test of QOLIE-31 scale: the internal consistency of Cronbach's α among all of the factors(items) in the scale was 0.9846. The internal consistency of Cronbach's α among the 7 items were respectively 0.9572、0.9615、0.9693、0.9781、0.9804、0.9597 and 0.9580.

Validity test of QOLIE -31 scale: 1.Construct validity: the KMO of the sampling data constituted by the 31 items was 0.934>0.7, this indicated that factors analysis was suitable. In Bartlett's test of sphericity, $\chi 2 = 12158.534$, $P < 0.001$, this indicated that there were common factors in the correlation matrix between the various factors, and factors analysis was suitable; 2.Content validity: analysis showed that the Pearson correlation coefficient > 0.5($P < 0.05$)in various fields and aspects of the scale; 3.Discrimination validity: differences of the scores of QOL in all kinds of fields were statistically significant.

The internal consistency of Cronbach's α among all of the items in SAS scale was 0.9498; The internal consistency of Cronbach's α among all of the items in the CES-D scale was 0.9613. KMO value of SAS scale and CES-D scale was respectively 0.885,0.939; The χ^2 value of Bartlett's test of sphericity was respectively 30116.570,28648.566（$P<0.001$）.

2.2 General demographic characteristics

Among the 847 patients with epilepsy in this study area, there were 502 male patients (57.44%) and 372 female patients (42.56%), the number of male patients was larger than the female. The age ranged between 17～82 year old, and the median age was 44 years old. There were 364 peasants,

accounting for 73.83% of the total population of epileptic patients.

Among the 847 patients with epilepsy, the minimum value of QOL was 1, the maximum value was 100, the mean value was 55.37, and the median value was 56. The 4 quartile values of QOL was respectively 28, 44, 67 and 78. The general demographic characteristics of the patients with epilepsy with different levels of QOL were seen at Table 1.

Table 1. General demographic characteristics of the patients with different levels of QOL N (%)

Demographic characteristics		Level 1	Level 2	Level 3	Level 4
Age group	17 ~ 30	3(1.41)	50(22.62)	41(20.3)	79(33.19)
	30 ~ 45	40(18.78)	85(38.46)	47(23.27)	96(40.34)
	45 ~ 59	89(41.78)	51(23.08)	68(33.66)	53(22.27)
	59 ~ 82	81(38.03)	35(15.84)	46(22.77)	10(4.2)
Gender	male	114(53.52)	133(60.18)	123(60.89)	132(55.46)
	female	99(46.48)	88(39.82)	79(39.11)	106(44.54)
Marital Status	Married	178(83.57)	152(68.78)	139(68.81)	147(61.76)
	Divorced/ separated	16(7.51)	18(8.14)	30(14.85)	22(9.24)
	widow	13(6.1)	6(2.71)	4(1.98)	2(0.84)
	unmarried	6(2.82)	45(20.36)	29(14.36)	67(28.15)
Education Level	illiteracy/semi-illiteracy	77(36.15)	41(18.55)	45(22.28)	44(18.49)
	Primary school	86(40.38)	103(46.61)	76(37.62)	106(44.54)
	Junior high school	42(19.72)	64(28.96)	60(29.7)	67(28.15)
	High/Technical school	6(2.82)	12(5.43)	20(9.9)	18(7.56)
	College and above	2(0.94)	1(0.45)	1(0.5)	3(1.26)
Occupation	“employed”	20(9.39)	33(14.93)	30(14.85)	29(12.18)
	“unemployed”	35(16.43)	38(17.19)	28(13.86)	43(18.07)
	peasant	158(74.18)	145(65.61)	139(68.81)	156(65.55)
	student	0(0)	5(2.26)	5(2.48)	10(4.2)
Economic Status	80 ~	17(7.98)	32(14.48)	61(30.2)	74(31.09)
	400 ~	57(26.76)	61(27.6)	63(31.19)	73(30.67)
	700 ~	71(33.33)	49(22.17)	19(9.41)	33(13.87)
	900 ~	43(20.19)	47(21.27)	40(19.8)	43(18.07)
	1400 ~ 2700	25(11.74)	32(14.48)	19(9.41)	15(6.3)

2.3 Univariate cumulative odds logistic regression analysis

Not take grouping into consideration, the lower, middle and upper quartile of QOL score in patients with epilepsy were 37, 56 and 74 respectively in this study. Possible factors that may influence the QOL level (Y=level 4 was set as 1, level 3 was set as 2, level 2 was set as 3, level 1 was set as 4) of patients

with epilepsy, such as demographic variables (gender, age, occupation, culture, etc) , disease related variables (duration, seizure frequency, etc) and psychological variables (depression, anxiety) were taken into cumulative odds logistic model univariate analysis, the results revealed that excluding gender, inheritance, economic status, disease duration of “20 to 30 " and " 30 to 37 ", profession (excluding students) and " mild " anxiety, QOL scores differences were statistically significant (P <0.05) in patients with different ages, marital status, ages of onset, seizure frequencies, types of medication intake, compliances, anxiety and depression.

Table 2. The results of univariate cumulative logistic regression analysis of different factors.

Influencing factors	OR(95%CI)	*SE*	*Z*	*P*
1. General demographics				
Age				
(control= 17 ~)				
30 ~ 45	1.83(1.29 ~ 2.59)	0.32	3.41	0.001*
45 ~ 59	3.67(2.58 ~ 5.24)	0.66	7.19	<0.001*
59 ~ 82	7.30(4.91 ~ 10.85)	1.48	9.82	<0.001*
Gender				
(control =male)				
female	1.04(0.82 ~ 1.33)	0.12	0.35	0.724
Marriage				
(control =married)				
Divorced / separated	0.67(0.45 ~ 0.99)	0.30	-2.02	0.043*
Widow	2.86(1.34 ~ 6.09)	0.13	2.72	0.006*
Unmarried	0.35(0.25 ~ 0.49)	0.48	-6.20	<0.001*
Education Level				
(control = Illiterate)				
Primary school	0.63(0.46 ~ 0.86)	0.10	-2.91	0.004*
Junior high school	0.53(0.38 ~ 0.75)	0.09	-3.61	<0.001*
High school /secondary school	0.38(0.23 ~ 0.64)	0.10	-3.66	<0.001*
College and above	0.45(0.10 ~ 1.98)	0.10	-2.91	0.004*
Occupation				
(control =“In-service”)				
“Unemployed”	1.09(0.70 ~ 1.68)	0.21	0.37	0.708
Peasant	1.20(0.84 ~ 1.70)	0.15	0.99	0.320
Student	0.37(0.16 ~ 0.88)	1.19	-2.26	0.024*
Economic Status				
(control=80 ~)				
400 ~	2.01(1.43 ~ 2.82)	0.09	4.00	0.358
700 ~	4.93(3.34 ~ 7.27)	0.04	8.03	0.011
900 ~	2.44(1.68 ~ 3.54)	0.08	4.67	0.395
1400 ~ 2700	3.40(2.17 ~ 5.32)	0.07	5.36	0.401

2. Clinically relevant data				
Duration of the disease				
(control =0 ~ 10)				
10 ~ 20	0.60(0.43 ~ 0.85)	0.29	-2.89	0.004*
20 ~ 30	0.76(0.54 ~ 1.06)	0.23	-1.60	0.110
30 ~ 37	0.97(0.66 ~ 1.42)	0.20	-0.17	0.864
>37	2.31(1.45 ~ 3.68)	0.10	3.52	<0.001*
Age of onset				
(control =0 ~ 11)				
11 ~ 20	1.81(1.29 ~ 2.55)	0.10	3.40	0.001*
20 ~ 34	2.04(1.44 ~ 2.87)	0.09	4.06	<0.001*
34 ~ 50	2.62(1.77 ~ 3.88)	0.08	4.81	<0.001*
≥50	5.88(3.70 ~ 9.34)	0.04	7.5	<0.001*
Seizure frequency (control=controlled)				
Mild	7.14(5.12 ~ 9.95)	0.02	11.59	<0.001*
Moderate	13.12(8.98 ~ 19.15)	0.01	13.33	<0.001*
Severe	8.71(5.77 ~ 13.15)	0.02	10.29	<0.001*
Types of Medication intake (control = Multi-medications)				
Single-medication	0.11(0.08 ~ 0.14)	0.02	-14.91	<0.001*
Familial Inheritance (control =no)				
Yes	0.73(0.49 ~ 1.08)	0.14	-1.60	0.111
Epilepsy knowledge awareness rate (control =high)				
Low	14.27(10.64 ~ 19.13)	2.13	17.78	<0.001*
Compliance (control=good)				
Bad	29.64(20.87 ~ 42.08)	5.30	18.95	<0.001*
3. Psychological data				
Depression (control=no)				
Yes	4.80(3.68 ~ 6.27)	0.65	11.53	<0.001*
Anxiety (control =no)				
Mild	1.15(0.73 ~ 1.81)	0.27	0.59	0.557
Moderate	9.51(6.02 ~ 15.03)	2.22	9.65	<0.001*
Severe	32.12(20.36 ~ 50.66)	7.47	14.92	<0.001*

*P < 0.05 , and the difference was statistically significant.

2.4 Multivariate ordinal cumulative logistic regression analysis

To further understand the different factors influencing patients' quality of life, variables which were statistically significant in univariate ordinal logistic regression were taken into multivariate ordinal cumulative logistic regression analysis to analyze the different levels of QOL（Y=1, 2, 3, 4）in patients with epilepsy(Categorical variables were taken into the equation in the form of dummy variables, and the first dummy variable for each variables was set as a reference) .

The applicability analysis of the model revealed that the χ^2 value of proportional odds assumption was 8.46 (P=0.379), in accordance with the basic assumptions of cumulative odds logistic models test(Roberts and Vernon, 1983) . The results revealed：The regression equation was statistically significant（χ^2 = 948.59 , P<0.0001）, CraggUhler(Nagelkerke) R^2= 0.707, ML (Cox-Snell) R^2= 0.662. AIC= 1.716. The frequency of seizures, awareness rate of knowledge about epilepsy, anxiety, depression, types of medication intake and compliance were the main factors influencing QOL of patients with epilepsy. Among them, high seizure frequency along with anxiety and depression were risk factors of QOL; high epilepsy knowledge awareness rate, single medication intake, and good compliance were protective factors. The details were seen in Table 3.

Table 3. Results of multivariate categorical cumulative odds logistic regression analysis

Influencing factors	OR	*β(95%CI)*	SE	*z*	*P*
Types of medication intake(control = Multi-medications)					
Single-medication	0.14	-1.96(-2.37 ~ -1.54)	0.21	-9.32	<0.001*
Compliance (control=good)					
Bad	7.00	1.95(1.39 ~ 2.50)	0.28	6.92	<0.001*
Seizure frequency(control=controlled)					
Mild	3.54	1.26(0.79 ~ 1.73)	0.24	5.29	<0.001*
Moderate	2.15	0.76(0.23 ~ 1.29)	0.27	2.82	0.005*
Epilepsy knowledge awareness rate (control=high)					
Low	4.81	1.57(1.08 ~ 2.06)	0.25	6.22	<0.001*
Depression (control=no）					
Yes	1.49	0.40(0.01 ~ 0.79)	0.20	2.03	0.043*
Anxiety (control=no）					
Mild	0.33	-1.10(-1.73 ~ -0.48)	0.32	-3.46	0.001*
Moderate	3.42	1.23(0.65 ~ 1.81)	0.30	4.16	<0.001*
Severe	13.26	2.58(2.01 ~ 3.16)	0.30	8.74	<0.001*

* P < 0.05,the difference was statistically significant.The constant terms (cut1, cut2, cut3) were not listed.

Table 4. Results of non-conditional multivariate ordinary binary logistic regression analysis.

Influencing factors	OR(95%CI)	SE	*z*	*P*
Types of medication intake (control = Multi-medications)				
Single-medication	0.09(0.03 ~ 0.29)	0.05	-4.10	<0.001*
Depression (control=no)				
Yes	9.39(3.32 ~ 26.56)	4.98	4.22	<0.001*
Seizure frequency (control=controlled)				
Low	3.58(1.45 ~ 8.89)	1.66	2.75	0.006*
Moderate	10.74(3.86 ~ 29.91)	5.61	4.55	<0.001*
High	26.22(3.25 ~ 211.62)	27.94	3.07	0.002*

* P < 0.05, the difference was statistically significant.

The results of ordinary binary (cut point set at P75, the 75% position in the percentile scale was set as the passing or qualifying point) non-conditional multivariate ordinal logistic regression analysis (variables which were statistically significant in univariate ordinal logistic regression were taken into the multivariate ordinal logistic regression): The regression equation was statistically significant. (χ^2 = 215.98，P<0.0001), Nagelkerke R^2= 0.506. Cox-Snell R^2= 0.379.AIC= 0.947. The results revealed that seizure frequency, types of medication intake and depression were the main factors influencing QOL of patients with epilepsy. The details are shown in table 4.

3. Discussion

Ordinal cumulative odds models is also known as proportional odds model or ordinal logit model, it is an extension of binary logistic regression model (Peter 1980; Armstrong and Sloan 1989; Brant 1990)，and is mainly used to handle the data whose response variables are ordinal categorical responses. Many studies(RenXiaolin and Liu Xueqin, 2003; Geng Xiang, Wu Yiwen et al., 2007; Tong Xiaoyan, Yan Junjie et al., 2010; Yang Miao and Wang Kai, 2010; Liu, Han et al., 2011; Shetty, Naik et al., 2011; Zhao, Wu et al., 2011; Gao Yan, Xu Huashan et al., 2011) used linear model (such as linear regression) directly without carrying out homogeneity of variance and normality tests, thus the model applicability was in doubt and the conclusion was not reliable. If such data is converted to binary variables to conduct ordinary logistic regression analysis, the cut point is of vital importance. For example, quality of life score in epilepsy was set as response variable, we converted the score to a 100-point scale and artificially set 60 points (split point) as the "passing" or "qualifying" point, then converted response variables to the binary variables 0 and 1, the “qualifying” point could also be set at 75 or 80 points, etc. Therefore, in addition to meaningful professional division (For example, a percentile scale of psychology set more than 80 points as positive for depression), the choice of the cut-off point often has not a certain base or standard. If there are more than 1 cut-off point, the form of the response variables is polytomous and can be divided into polytomous unordinal data and polytomous ordinal data based on whether the response variables are ordinal or not. So for the ordinal data which neither meet the requirements of the linear model nor have the professional cut-off point, it can’t be converted to the binary variables to conduct ordinary logistic regression analysis. At this time the binary is the merger of the cut points (grades) and it will inevitably lead to loss of data and reduce the reliability of conclusion.

In the study, the applicability analysis of the cumulative odds model revealed that χ^2 value of proportional odds assumption was 8.46 (P=0.379), meaning that the regression lines of different cumulative odds were parallel to each other. That means the regression coefficient of the independent variable had no correlation with the cut-off point, only intercept parameters varied, the data met the basic condition assumptions(Wang Jichuan and Guo Zhigang, 2001) of cumulative odds logistic model test. Some studies (Likang, Guo Zuchao et al., 1993; Chen Peizhen and Chen Feng, 2001) revealed that cumulative odds model was not sensitive to this "condition", however, other studies found that the test efficiency of the model would be reduced and might

lead to misleading conclusions when it did not meet this assumption condition. In this study, the cumulative odds regression results revealed that: Nagelkerke R^2=0.707,ML R^2= 0.662, the predictive accuracy(Wang Jichuan and Guo Zhigang, 2001) of the regression model was better if the value of R^2 (close to 1) was greater. AIC=1.716, AIC was the index that reflected goodness of fit of the regression model, whose value should be as small as possible. The result of ordinary binary non-conditional multivariate ordinal logistic regression analysis for the same data revealed (see table 4): Nagelkerke R^2= 0.506,Cox-Snell R^2= 0.379,the prediction accuracy of accumulative odds model was higher than that of ordinary binary logistic regression. The AIC of ordinary binary logistic regression was 0.947, this suggested that the accuracy of the ordinary binary logistic model was good, meeting the principle that the number of independent variables should be "fewer but better" (Wang Jichuan and Guo Zhigang, 2001). However, this simple model missed some important and modifiable influencing factors such as compliance, anxiety and epilepsy knowledge awareness rate. More importantly was that the corresponding results were inconsistent if the cut-off point is replaced by P60 or P70 (more than 60 or 70 percentile as "qualifying" for an ordinary binary logistic regression), this suggested that the results of the cumulative odds logistic model were more stable and reliable for the data which did not meet the requirements of the linear model.

Our research revealed that the mean QOL in patients with epilepsy without intervention was 37.89(the median level was 37), lower than that in other domestic studies, such as 55.2 by Yang Miao(Yang Miao and Wang Kai, 2010) and 58.9 by Zhu Suiqiang(Zhu Suiqiang et al., 2010). The results of different studies varied, the influencing factors analysis(Yang Miao and Wang Kai, 2010; Geng Xiang et al., 2007; Tong Xiaoyan et al, 2010; Kubota H. et al, 2010; Guekht A. B. et al, 2007)in the conclusions also varied, there may be 2 possible reasons to explain this: the first one is that the diagnostic criteria and QOL scales used in these studies were not consistent, the second one is that the statistical methods used in these studies were not consistent, and in many studies the statistical methods were wrongly used. For example, in some studies, also the data did not meet the requirements of linear model, multivariate logistic regression and variance analysis were used. More importantly, samples in these studies(Yang Miao and Wang Kai, 2010; Ren Xiaolin and Liu Xueqin, 2003; Geng Xiang et al., 2007; Gao Yan et al, 2011; Tong Xiaoyan, 2010)are clinically opportunistic collection, the size of the sample was small, and no random sampling was conducted, thus there were various types of biases. Conclusions under these kinds of circumstances were not representative and could not reflect the real conditions. In our study, the sample was collected by multi-stage stratified random sampling among patients with epilepsy who were enrolled in and not enrolled in the project management in 9 project sites in our province, the sample size was large enough to have a good representation.

By multivariate cumulative odds logistic analysis, our research revealed that seizure frequency, anxiety, depression, types of medication intake and compliance were major influencing factors of QOL among patients of epilepsy. Among the various conclusions in previous studies (Yang Miao and Wang Kai, 2010; Geng Xiang et al, 2007; Tong Xiaoyan, 2010; Gao Yan et al, 2011; Guekht A. B. et al., 2007) conducted in domestic areas and overseas, "seizure frequency is the most important influencing factor on QOL" was a widely accepted conclusion, good control of seizures indicated high QOL score, this suggests that it is necessary to carry out targeted health promotion and standardized therapy among poorly controlled patients to improve their QOL. Some research11 , 13-15,23,27 (Yang Miao and Wang Kai, 2010; Geng Xiang et al., 2007; GaoYAN et al., 2011;Tong Xiaoyan et al., 2010; Zhu Suiqiang et al., 2003; Xu Hong et al., 2008) suggested that the correlation between the compliance, anxiety, awareness rate of knowledge on epilepsy and QOL was not statistically significant, this was similar with the results of ordinary binary non-conditional multivariate analysis. This results suggested that also ordinary binary logistic regression analysis meet the "less but better" rule(Wang Jichuan and Guo Zhigang, 2001) in the choose of independent variables, it couldn't cover all the key modifiable factors, it was with "mathematical" value but couldn't be applied in the practice of targeted health promotion and epilepsy prevention and treatment project.

The results of our research revealed that patients who took single medication had higher QOL and less worry about the side effects of the medication, cumulative odds logistic regression analysis also revealed that single medication intake was a protective factor of QOL, this was in consistent with previous literatures(Baker, Jacoby et al., 1997; Zhu Dantong, Xiao Bo et al., 2002; Lin Juanxia, Sun Meizhen et al., 2009). The higher awareness rate of knowledge on epilepsy indicated higher QOL score, this suggests that it is necessary to carry out targeted health promotion and education measures among low QOL score patients to improve their compliance and awareness rate of the knowledge on epilepsy. In addition, we must pay attention to the effect of

concomitant anxiety and depression on knowledge of epilepsy, this was in consistent with previous studied conducted by Choi-Kwon(Choi-Kwon, Chung C et al., 2003) etc in South Korean population and Tong Xiaoyan15(Tong Xiaoyan, Yan Junjie et al., 2006), Xu Hong(Xu Hong, Long Faqing et al. 2006), Zhao Xiuhe(Zhao Xiuhe, Chi Zhaofu et al. 2006) in Chinese population. Our research also revealed that patients with concomitant depression had evidently lower overall health level, more worry about attacks, impaired emotional health and damaged vigour. Thus, it is necessary to conduct supportive psychological therapy among these patients to help them increase the ability to cope with difficulties and bad stimulus, and walk out the psychological dilemma.

To sum up, the QOL of patients with epilepsy in this region was relatively lower than that in other areas, this suggests that it is necessary to lay stress on intervening the modifiable factors of target patients, carrying out pertinent health promotion and health education to improve the awareness rate of knowledge on epilepsy, and strengthening standardized treatment, follow-up management and psychological intervention therapy to improve the QOL of patients and reducing the disease burden due to epilepsy. It is also necessary to conduct various broadcast and education activities with the help of the media, in aid to increase the public's insight about epilepsy, win the society's support, and change people's discriminative attitude towards epilepsy.

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Corresponding Author:
prof. XU Yuming
Department of Neurology
First Affiliated Hospital of Zhengzhou University
Zhengzhou, 450052, China
E-mail: xuyuming@zzu.edu.cn

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