

Family Doctor Contract Services and Health-Related Quality of Life Among Patients With Chronic Diseases in Rural China: What Is the Role of Socioeconomic Status?

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Research

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Abstract

Purpose

The relationship between family doctor contract services (FDCS) and health-related quality of life (HRQOL) among patients with chronic diseases in rural China was unknown. This study aims to explore the relationship between status of signing on FDCS and HRQOL among patients with chronic diseases and examine whether there are differences in the relationship between different socioeconomic status (SES).

Methods

A total of 1,210 respondents were included in this study. HRQOL was measured by EQ-5D-3L. The contracting status was divided into uncontracted and contracted. Tobit regression and Logistic regression were employed to explore the association between contracting status and HRQOL. The interaction terms were included to explore the differences in the association among different SES status.

Results

Contracting with family doctors was associated with HRQOL (coefficient = 0.042; 95%CI 0.008 to 0.075). The association was different among different socioeconomic levels that the contracting status was only associated with HRQOL in low-income ($P < 0.01$) and highly educated patients ($P < 0.05$). Compared with uncontracted patients, contracted patients reported higher ED-5D-3L utility value in the low-income group (coefficient = 0.116; 95%CI 0.039 to 0.194) and high educational attainment (coefficient = 0.236; 95%CI 0.095 to 0.377).

Conclusions

This study found a significant association between FDCS and HRQOL among chronic patients in rural Shandong, China. This relationship varied by income levels and educational attainment. The government should take efforts to formulate a variety of measures to encourage chronic patients to contract with family doctors, with special attention to people with low SES.

Introduction

With the aging of the population and the change of disease spectrum, the morbidity and mortality of chronic diseases such as hypertension, diabetes, and coronary heart disease has been on a rapid rise in the past decades. According to the World Health Statistics Report 2020, 42 million people worldwide died of chronic diseases in 2016, accounting for about 71% of all deaths [1]. In China, chronic diseases account for more than 80% of the total 10.3 million deaths and over 70% of the burden of disease each year [2, 3]. Previous studies showed that grass-root preventive interventions could improve the unhealthy lifestyles of people with chronic diseases. Primary health care can effectively reduce the morbidity and mortality of chronic diseases, control the condition of those with chronic diseases, and reduce the burden of chronic diseases [4, 5]. Therefore, many developed countries have established the gatekeeper system in health care, such as the United States and the United Kingdom, in which the primary care physicians played a key role [6].

As a developing country, China has been in the process of establishing family doctor contract services (FDCS) system in health care since 2009. The long-term medical cooperation between family doctors and the residents is established by signing the contract of the service, so as to better understand the healthcare needs of the residents and improve the health status of the residents through the formulation of personalized intervention plans [7, 8]. In 2016, the Chinese government fully implemented the family doctor signing system to carry out contract services. Due to the high incidence rate and high burden of chronic diseases, patients with chronic diseases were classified as the priority population [9]. In 2017, the coverage rate of FDCS for the priority population was required to reach over 60%. By 2020, the goal of full coverage of the FDCS system will be basically achieve.

Health-related quality of life (HRQOL) is a multidimensional indicator of health that includes physical functioning, mental health, and the socially relevant roles that an individual perceives over time [10]. HRQOL can be used as an input to calculate quality-adjusted life years (QALYs), one of the most commonly reported measures of benefit in health economic evaluations. It is often used to support for public health and health policy and has become very important at the policy level [11]. However, the association between FDCS and HRQOL is not yet clear. Clarifying the relationship between FDCS and HRQOL can provide new insight for better understanding the impact of FDCS on health among the patients with chronic diseases.

Socioeconomic status (SES) depends on a combination of variables including occupation, education, income, and place of residence [12]. Studies indicated chronic disease patients with low SES have lower HRQOL [13], and there were differences in income levels in terms of the relationship of FDCS and the utilization of health services for patients with chronic diseases [14]. Other studies have demonstrated there was a differential association between chronic conditions and HRQOL across different SES positions [15]. These findings suggest the

association between FDCS and HRQOL might be different among patients of chronic diseases with different SES, which needs to be clarified.

However, to date, there are few studies examined the possible difference in the association between FDCS and HRQOL. Thus, the present study aims to explore the relationship between FDCS and HRQOL among patients with chronic diseases and examine whether there are differences in this association across different SES status. Based on the previous findings, we hypothesized that (1) contracting with a family doctor was associated with better HRQOL; (2) there were differences in the association between FDCS and HRQOL in different SES.

Methods

Study population

The data used in this study were from the survey on FDCS that conducted in Shandong province, China in 2018. Shandong is the second most populous province in China with more than 100 million population in 2018, of which about 40% lived in rural areas. The multi-stage random sampling method was used to select the subjects. Firstly, we randomly selected three cities (Liaocheng, Zibo, and Binzhou) as study sites. Secondly, two counties were randomly selected from each sample city. Thirdly, five townships were randomly selected from each country and then six villages from each selected township were randomly selected. Finally, 16 households were randomly selected from each sample village, and only one member of a family (generally the main income earner or the elderly) was reviewed. Strict random number table sampling was used throughout the study. A total of 2,979 respondents were interviewed, of whom 1,210 patients with chronic diseases (hypertension, coronary heart disease, or diabetes) were included in the analysis.

The investigators were recruited from Shandong University. They were strictly trained before the investigation, including understanding the principles and methods of the survey, and standardizing the definition and interview skills of each study indicator, with the purpose of ensuring the quality of the survey. After the training, the investigators were given test on training effectiveness, and only those who were qualified could participate in the formal investigation. Each sampled township was also supervised by a trained supervisor who was responsible for guiding and (logical) checking survey questionnaire to ensure the accuracy and completeness of the questionnaires.

Measures

Family doctor contract services

The status of FDCS was a two-category variable. It was measured by the following yes-no question: "Did you contract with the family doctors this year?" [16, 17]

Similar with previous studies, household income, educational attainment, and employment status were used as proxies for SES [18-20]. In this study, we tried to use the main determinants of SES (i.e. household income, educational attainment and employment status). Educational attainment was recoded into three categories: low (primary education or below), intermediate (junior education), and high (senior education or above). According to the quartile methods, household income was classified into four categories: Q1, Q2, Q3, and Q4, from lowest to highest. We recoded employment status into two categories: unemployed and employed. Specifically, lower educational attainment, lower quartile, and unemployed status represent lower SES.

Health-related quality of life

Health-related quality of life (HRQOL) was assessed using the EQ-5D questionnaire, which consists of 5 health dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression). Each of the five dimensions has three levels indicating no problems, moderate problems or severe problems [21]. The EQ-5D-3L utility values are generated by weighting each dimension of the HRQOL, which use the time trade-off model set for the Chinese general population [22], ranging from -0.149 to 1.0, and the higher EQ-5D-3L utility values represent higher HRQOL.

Covariate variable

The marital status was divided into three categories: single, married, and others (divorced or widowed). The number of family members was divided into three categories: two and less, three to four, and more than four. The drinking status was divided into three categories, including never drinkers, current drinkers, and former drinkers. Other covariate variables include age, gender, multiple chronic diseases status, and physical exercise.

Statistical analyses

Statistical analyses were performed using Stata 14.0. The reported credible intervals (CIs) were calculated at the 95% level and *P* values less than 0.05 were considered statistically significant. First, we used frequencies and percentages to describe the demographic characteristics of the respondents by family doctors contracting status (Yes/No). Second, independent-samples t-test was used to compare the EQ-5D-3L utility values between contracting status. Third, Tobit regression was employed to explore the association between contracting status of family doctors and EQ-5D-3L utility values. Logistic regression was performed to explore the association between contracting status and each dimension of EQ-5D-3L. Finally, in order to explore whether there were differences in the association among different SES status (income, educational attainment, and employment status), interaction terms between contracting status and SES status were introduced in the Tobit regression models, and if the interaction terms were statistically significant in that Tobit regression model, we further stratified the regression analyze by different SES status (income, educational attainment, and employment status).

Results

Socio-demographic characteristics

Table 1 shows the demographic characteristics of the respondents. Of 1,210 patients with chronic diseases, 29.3% contracted with family doctors. The majority of the patients were never drinkers (63.8%), female (55.9%), married (84.0%), and with one or two family members (60.8%), participate in physical activities (55%), and without multiple chronic diseases (70.7%). In terms of SES, the vast majority of respondents were employed (69.3%), had an education level of primary school or below (70.0%), and had lower middle-income level (51.1%).

EQ-5D-3L values by different contracting status

As shown in the Table 2, among the 1,210 respondents, the mean EQ-5D utility value was 0.844 (± 0.177). The independent-samples t-test results showed that there were significant differences in EQ-5D-3L utility value between different contracting status, the mean EQ-5D-3L utility values were higher among contracted patients than uncontracted patients, and more problems were reported in the uncontracted patients group of all dimensions.

When stratified by household income, differences in EQ-5D-3L utility values were shown across different contracting status in low-income and sub-low-income groups, whereas this difference was not found in high-income and second-high-income groups. When stratified by educational attainment, there were differences in EQ-5D-3L utility values across different contracting status in the primary school and below, high school and above age groups. Regardless of whether they were employed or not, the EQ-5D-3L utility values of different contracting status was significantly different. The EQ-5D-3L utility values of the contracted group was higher than that of the uncontracted group in all the groups which had significant differences.

The relationship between family doctors contracting status and HRQOL among people with different SES

We present the results in three models so that the association between FDCS and HRQOL could be better explored (Table 3). In Model 1, after adjusting for the age, gender, marital status, family members, multiple chronic diseases status, drinking status and sports participation, the result demonstrated that FDCS was significantly associated with the HRQOL. Compared with those who did not contract with family doctors, the EQ-5D-3L utility (coefficient=0.042; 95%CI 0.008 to 0.075) value of patients with chronic diseases who contracted with family doctors was significantly higher. When including the interaction terms between household income and contracting status into Tobit regression, model 2 shows an income difference in the association between contracting status and EQ-5D-3L utility value is significant ($P < 0.05$). Specifically, Table 4 shows that in the low-income group, EQ-5D-3L utility value of the contracted patients is higher than that of the non-contracted patients. When including the interaction terms between educational attainment and contracting status into Tobit regression, model 3 shows that there is also significant difference in educational attainment between the contracting status and EQ-5D-3L utility value ($P < 0.05$). Among the highly educated group, contracted patients showed a significantly higher EQ-5D-3L utility value compared with non-contracted patients. In addition, the relationship between contracting status and HRQOL is not modified by employment situation. Furthermore, Table 4 shows that in the low-income group, the contracted group reports fewer problems in mobility ($P = 0.029$; OR = 0.47), pain/discomfort ($P = 0.005$; OR=0.43), and anxiety/depression ($P = 0.027$; OR = 0.46) dimension of EQ-5D-3L. In the group with senior education or above, contracted patients report less problems in pain/discomfort ($P = 0.001$; OR = 0.178) and anxiety/depression ($P = 0.024$; OR = 0.124) dimension of EQ-5D-3L than uncontracted patients.

Discussion

The signing rate of family doctors with chronic diseases in rural areas of Shandong Province in the current study was approximately 28.9%. It was far lower than the target of 60% signing rate of key groups [9], which was consistent with previous studies. It indicated that there was still a long way to push forward the FDCS among the vulnerable groups of the population in rural China. This finding also implied a need for

studies to explore the potential barriers in FDCS among the rural patients with chronic conditions in China [23]. In addition, the signing rate among high-income group (Q4; 34.7%) and middle-income group (Q2, Q3; 30.1%) is higher than that among low-income group (Q1; 22.7%). The signing rate of family doctors in patients with medium and high educational level was higher than that of patients with low educational level. The possible reason was that the patients with high income or high educational level might have better health awareness, tended to agree with advanced health service ideas, and had a higher demand of the FDCS.

The current study also demonstrated that FDCS was associated with HRQOL among patients with chronic diseases, and the contracted group reported higher HRQOL scores than the uncontracted group, which was consistent with previous studies in Turkey and Guangdong, China [24, 25, 26]. Contracting with family doctors could improve disease awareness and treatment compliance in patients with chronic diseases such as hypertension, which was useful for controlling the anxiety level of patients [19, 27-29]. Poor medication compliance, mood depression and anxiety were found to be associated with poor quality of life. We also found that the contracted group reported the lower proportion of problems in the five dimensions of HRQOL, which also proved that signing with a family doctor had a positive impact on both physiological and psychological well-being.

This study indicated that there was a significant difference in the association between contracting status and HRQOL across low-income, middle-income, and high-income groups. Specifically, the results showed that only in the low-income group, contracting status was correlated with HRQOL. One possible interpretation for this finding might be that in the middle and high-income groups, patients with chronic diseases would take the initiative to seek medical treatment and had sufficient health care resources. Whether they signed up or not would not affect their medical treatment and health care behaviors. [30] However, low-income patients were unable to obtain long-term high-quality medical care due to economic weakness and lack of medical resources. Family doctors could help them to obtain timely and effective chronic disease management services so as to improve their HRQOL [29, 31].

Our findings also showed that the HRQOL of contracted patients with high educational level was significantly different from the HRQOL of non-contracted patients with high educational level, while there was no significant difference in HRQOL between patients with middle and low levels of education. An interpretation for this finding might be that patients with chronic diseases with high educational level could better understand the relevant policies of FDCS, had higher acceptance of health knowledge [16], and had higher utilization willingness of contracted services, so they had been in better management of chronic diseases, and thus had higher EQ-5D-3L utility value. Contracted patients with low educational level may lead to low utilization rate of contracted services due to insufficient awareness of the contract content and low health literacy [32, 33].

Interestingly, we found that the employment difference in the association between contracting status and EQ-5D-3L utility value was not significant. The possible reason was that the composition of urban occupation was complex, and there were differences in the working environment and medical resources among different types of occupations. However, the composition of rural occupation was simple, most of the residents were engaged in agriculture or forestry, and there was no significant difference in the working environment.

This study is the first to comprehensively explore the relationship between FDCS and HRQOL among the Chinese rural patients with chronic diseases. It has several implications for the policy-makers. Firstly, the government should focus on the HRQOL of rural patients with chronic diseases and increase the rate of signing family doctors. Based on the existing local health resources, the government should improve the service quality and enhance the residents' trust in the clinics. In view of the priority population, health management should be strengthened to meet personalized health needs, so as to improve the enthusiasm of patients to contract with family doctors. Secondly, our findings confirm the importance of accounting for SES when evaluating the effectiveness of FDCS, so the local government should develop a targeting signing plan for different subpopulation to reduce health inequalities.

Our study has several limitations. First, the cross-sectional data used in this study does not allow determining whether the associations detected reflect a causal relationship, and a longitudinal design is needed in the future study. Second, we only included patients with hypertension, diabetes, and heart disease in the study, the types of chronic diseases involved were limited, and the severity and duration of chronic diseases were not carefully divided, which would be gradually supplemented in the follow-up study.

Conclusions

This study demonstrated a significant association between FDCS and HRQOL among the patients with chronic diseases in rural China, and there were differences in this relationship among patients with different SES levels. Compared with non-contracted patients, contracted patients reported significantly higher HRQOL scores in low-income or high educational level patients. The government should take efforts to increase the signing rate of family doctor services in rural patients with chronic diseases in particular by encouraging the subgroup of low socio-economic status to actively sign up and use family doctor services, so as to improve HRQOL.

Declarations

Ethics approval and consent to participate

The Ethical Committee of Shandong University reviewed and approved the study protocol. All participants gave their informed written consent for participation prior to the face-to-face interview.

Consent for publication

Not applicable.

Availability of data and materials

Not applicable.

Competing interests

All authors declare no conflict of interest.

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Authors' contributions

Conceptualization, Writing—review and editing, Funding Acquisition, Supervision: Chengchao Zhou; Methodology: Jie Li, Yan Chen, Zhengyue Jing; Formal analysis and investigation: Peipei Fu, Yemin Yuan, Shijun Yang, Chen Yan, Wenjuan Li, Jie Li, Zhen Gui; Investigation, Writing - original draft preparation: Zhixian Li.

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Tables

Table1 Basic characteristics of FDCC among patients with chronic diseases in rural Shandong, China, 2018

Characteristic	N (%)	Contracting status		P-value
		Yes (%)	No (%)	
Observations [n]	1210 (100%)	355 (29.3)	855 (70.7)	
Age (Years)				0.086
≤70	906 (74.9)	254 (28.0)	652 (72.0)	
>70	304 (25.1)	101 (33.2)	203 (66.8)	
Gender				0.003
Male	534 (44.1)	180 (33.7)	354 (66.3)	
Female	676 (55.9)	175 (25.9)	501 (74.1)	
Educational attainment				0.000
Primary education or below	798 (70.0)	205 (25.7)	593 (74.3)	
Junior education	298 (24.6)	100 (33.6)	198 (66.4)	
Senior education or above	114 (9.4)	50 (43.9)	64 (56.1)	
Household income^a				0.012
Q1	309 (25.5)	70 (22.7)	239 (77.4)	
Q2	309 (25.5)	93 (30.1)	216 (69.9)	
Q3	295 (24.4)	89 (30.2)	206 (69.8)	
Q4	297 (24.6)	103 (34.7)	194 (65.3)	
Multiple chronic diseases				0.055
No	855 (70.7)	237 (27.7)	618 (72.3)	
Yes	355 (29.3)	118 (33.2)	237 (66.8)	
Employment status				0.058
Unemployed	372 (30.7)	123 (33.1)	249 (66.9)	
Employed	838 (69.3)	232 (27.7)	606 (72.3)	
Drinking status				0.000
Never drinkers	772 (63.9)	194 (25.1)	578 (74.9)	
Former drinkers	155 (12.8)	54 (34.8)	101 (65.2)	
Current drinkers	282 (23.3)	106 (37.6)	176 (62.4)	
Physical exercise				0.000
No	544 (45.0)	122 (22.4)	422 (77.6)	
Yes	666 (55.0)	233 (35.0)	433 (65.0)	
Marital status				0.336
Single	15 (1.2)	3 (20)	12 (80.0)	
Married	1017 (84.1)	307 (30.2)	710 (69.8)	
Others ^b	178 (14.7)	45 (25.3)	133 (74.7)	
Family members				0.781
1~2	604 (49.9)	177 (29.3)	427 (70.7)	
3~4	293 (24.2)	90 (30.7)	203 (69.3)	
≥5	313 (25.9)	88 (28.1)	225 (71.9)	

Note: FDCS: family doctor contract services.

^a Q1 was the poorest and Q4 was the richest.

^b Others include those who are divorced and widowed.

Table 2 Observed utility values of EQ-5D-3L of chronic patients by contracting status and household income in rural Shandong, China, 2018

Characteristics	Mean ± SD ^a	EQ-5D-3L (%) ^b				
		Mo	SC	UA	PD	AD
Total	0.844±0.177	24.9	11.9	24.5	52.5	22.3
Contracting status ^c						
No	0.831±0.006	28.1	13.9	27.6	54.7	24.3
Yes	0.875±0.007***	17.2	7.0	16.9	47.3	17.5
Household income						
Q1						
No	0.775±0.013	38.9	21.8	37.7	65.3	32.2
Yes	0.860±0.019**	22.9	10.0	25.7	45.7	17.1
Q2						
No	0.823±0.012	30.6	15.3	28.7	56.0	25.5
Yes	0.872±0.014*	17.2	7.5	18.3	47.3	19.4
Q3						
No	0.859±0.011	20.4	9.7	22.3	51.5	19.4
Yes	0.881±0.014	16.9	6.7	19.1	46.1	13.5
Q4						
No	0.877±0.011	20.1	7.2	19.6	43.8	18.6
Yes	0.883±0.012	13.6	4.9	7.8	49.5	19.4
Education attainment						
Primary education or below						
No	0.809±0.185	32.4	16.9	32.0	60.0	28.2
Yes	0.844±0.149*	22.9	9.8	20.5	56.6	22.0
Junior education						
No	0.883±0.153	18.2	6.6	16.7	42.9	13.6
Yes	0.904±0.115	11.0	3.0	12.0	42.0	15.0
Senior education or above						
No	0.869±0.181	18.8	9.4	20.3	43.8	21.9
Yes	0.942±0.118*	6.0	4.0	12.0	20.0	4.0
Employment status						
Unemployed						
No	0.765±0.204	42.6	24.1	41.8	68.6	29.7
Yes	0.842±0.160***	30.1	12.2	23.6	51.2	21.9
Employed						
No	0.858±0.162	22.1	9.7	21.8	49.0	22.1
Yes	0.893±0.127***	10.3	4.3	13.4	45.3	15.1

Note: HRQOL: health-related quality of life; MO: mobility, SC self-care; UA: usual activity; PD: pain/discomfort; AD: anxiety/depression.

P-values with statistical significance: **P* < 0.05, ***P* < 0.01, ****P* < 0.001.

^a Observed EQ-5D-3L utility values; SD: standard deviation.

^b Observed frequency (%) of “have problems” in EQ-5D-3L dimensions.

^c Independent-samples t-test was used to compare the EQ-5D utility values between contracting status.

Table 3 The relationship between contracting status and HRQOL among chronic patients with different SES in rural Shandong, China, 2018

Characteristic	Model 1 no interaction			Model 2 Income × contracting status			Model 3 Educational attainment × contracting status		
	P-value	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value	Coefficient	95%CI
Contracting status									
No		Ref			Ref			Ref	
Yes	0.013	0.042	(0.008,0.075)	0.862	-0.006	(-0.069,0.057)	0.001	0.174	(0.068,0.281)
Household income^a									
Q1		Ref			Ref			Ref	
Q2	0.649	0.010	(-0.033,0.053)	0.366	0.022	(-0.026,0.071)	0.571	0.012	(-0.031,0.055)
Q3	0.085	0.040	(-0.006,0.086)	0.014	0.064	(0.013,0.114)	0.089	0.039	(-0.006,0.085)
Q4	0.014	0.059	(0.012,0.107)	0.001	0.090	(0.037,0.143)	0.010	0.062	(0.015,0.109)
Educational attainment									
Primary education or below		Ref			Ref			Ref	
Junior education	0.000	0.068	(0.030,0.105)	0.000	0.069	(0.031,0.106)	0.001	0.077	(0.032,0.121)
Senior education or above	0.004	0.084	(0.027,0.141)	0.002	0.088	(0.031,0.145)	0.393	0.031	(-0.040,0.101)
Gender									
Male		Ref			Ref			Ref	
Female	0.019	-0.052	(-0.096,-0.008)	0.029	-0.049	(-0.093,0.005)	0.017	-0.053	(0.097,-0.010)
Age									
≤70		Ref			Ref			Ref	
>70	0.177	0.026	(-0.012,0.066)	0.247	0.023	(-0.016,0.062)	0.168	0.027	(-0.011,0.066)
Multiple chronic diseases									
No		Ref			Ref			Ref	
Yes	0.000	-0.069	(-0.101,-0.037)	0.000	-0.070	(-0.102,-0.038)	0.000	-0.071	(-0.103,-0.039)
Employment status									
Unemployed		Ref			Ref			Ref	
Employed	0.000	0.099	(0.064,0.133)	0.000	0.099	(0.065,0.133)	0.000	0.100	(0.066,0.134)
Drinking status									
Never drinkers		Ref			Ref			Ref	
Former drinkers	0.127	-0.042	(-0.096,0.012)	0.151	-0.039	(-0.093,0.014)	0.123	-0.043	(-0.097,0.012)
Current drinkers	0.259	0.027	(-0.020,0.074)	0.253	0.028	(-0.020,0.075)	0.235	0.029	(-0.019,0.077)
Physical									

exercise									
No	Ref			Ref			Ref		
Yes	0.000	-0.056	(-0.086,-0.026)	0.000	-0.056	(-0.086,-0.026)	0.000	-0.056	(-0.086,-0.026)
Marital status									
Single	Ref			Ref			Ref		
Married	0.226	0.081	(-0.050,0.212)	0.221	0.082	(-0.049,0.213)	0.231	0.080	(-0.051,0.211)
Others ^b	0.620	0.033	(-0.100,0.167)	0.620	0.034	(-0.099,0.169)	0.605	0.035	(-0.098,0.168)
Family members									
1~2	Ref			Ref			Ref		Ref
3~4	0.154	0.029	(-0.011,0.069)	0.163	0.028	(-0.011,0.068)	0.211	0.026	(-0.015,0.066)
≥5	0.172	0.030	(-0.013,0.072)	0.152	0.031	(-0.011,0.073)	0.225	0.026	(-0.016,0.069)
Income × contracting status									
Q1 × contracted				0.009	0.125	(0.032,0.218)			
Q2 × contracted				0.198	0.058	(-0.030,0.147)			
Q3 × contracted				0.719	0.017	(-0.074,0.107)			
Educational attainment × contracting status									
Primary education or below × contracted							0.016	-0.139	(-0.253,-0.026)
Junior education × contracted							0.008	-0.167	(-0.292,-0.043)

Note: HRQOL: health-related quality of life; SES: socioeconomic status. SES: socioeconomic status.

^a Q1 was the poorest and Q4 was the richest.

^b Others include those who are divorced and widowed.

Table 4 The relationship between contracting status and HRQOL stratified by chronic patients with different household income and educational attainment in rural Shandong, China, 2018

Characteristics	EQ-5D-3L values	EQ-5D-3L dimension				
	Coefficient (95%CI) ^a	Mo	SC	UA	PD	AD
		AOR ^b (95%CI)	AOR (95%CI)	AOR (95%CI)	AOR (95%CI)	AOR (95%CI)
Household income						
Q1						
Uncontracted	Ref	1.0	1.0	1.0	1.0	1.0
Contracted	0.116** (0.039,0.194)	0.474* (0.244,0.921)	0.465 (0.193,1.119)	0.57 (0.305,1.080)	0.430** (0.240,0.772)	0.460* (0.227,0.929)
Q2						
Uncontracted	Ref	1.0	1.0	1.0	1.0	1.0
Contracted	0.049 (-0.134,0.112)	0.442* (0.226,0.863)	0.489 (0.199,1.201)	0.557 (0.293,1.060)	0.733 (0.433,1.241)	0.818 (0.428,1.560)
Q3						
Uncontracted	Ref	1.0	1.0	1.0	1.0	1.0
Contracted	0.013 (-0.051,0.076)	0.827 (0.398,1.697)	0.745 (0.263,2.109)	0.889 (0.444,1.778)	0.934 (0.525,1.661)	0.881 (0.409,1.900)
Q4						
Uncontracted	Ref	1.0	1.0	1.0	1.0	1.0
Contracted	-0.002 (-0.063,0.058)	0.602 (0.289,1.257)	0.708 (0.219,2.290)	0.286** (0.116,0.698)	1.208 (0.723,2.021)	1.144 (0.599,2.186)
Educational attainment						
Primary education or below						
Uncontracted	Ref	1.0	1.0	1.0	1.0	1.0
Contracted	0.037 (-0.004,0.077)	0.587 (0.395,0.873)**	0.569 (0.334,0.972)*	0.525 (0.351,0.786)**	0.888 (0.631,1.249)	0.727 (0.491,1.077)
Junior education						
Uncontracted	Ref	1.0	1.0	1.0	1.0	1.0
Contracted	0.001 (-0.063,0.065)	0.617 (0.277,1.372)	0.523 (0.031, 2.095)	0.803 (0.368,1.752)	0.987 (0.579,1.685)	1.623 (0.776,3.392)
Senior education or above						
Uncontracted	Ref	1.0	1.0	1.0	1.0	1.0
Contracted	0.236 (0.095,0.379)***	0.234 (0.051,1.086)	0.215 (0.017,2.666)	0.392 (0.099,1.546)	0.187 (0.064,0.545)**	0.124 (0.212,0.728)*

Note: HRQOL: health-related quality of life; MO: mobility; SC: self-care; UA: usual activity; PD: pain/discomfort; AD: anxiety/depression.

P-values with statistical significance: * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Adjusted for age, gender, marital status, sports participation, drinking status, multiple chronic diseases, family members.

^a EQ-5D-3L utility values, Regression coefficient based on a Tobit regression fully adjusted for

^b Odds ratio based on a multivariate logistic regression fully adjusted for