

Original Article

Correlation analysis between self-rated treatment effect and diagnosis and treatment of elderly poor cataract patients with poor financial condition in rural areas of Ganzi Prefecture

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Abstract: Objective: To analyze the correlation between self-rated treatment effect and diagnosis and treatment of elderly indigent cataract patients in rural areas of Ganzi Prefecture. Methods: In this retrospective study, senior cataract patients admitted in the Ganzi region from March 2018 to November 2021 were included. 495 indigent patients were classified into the poor group, including 400 cases who received surgical treatment and 95 who did not. The 318 patients that were not indigent were classified as the non-poor group. The basic demographic characteristics, treatment, self-assessed treatment effect, and the cost of surgery, blindness rate, and disability rate were compared between the two groups. The correlation between self-assessed treatment effect and treatment condition of patients in the poor group was analyzed by multi-factor unconditional logistic regression. Results: There were no significant differences in the basic demographic characteristics, self-assessed treatment effect, or postoperative blindness rate between the patients receiving surgery in both groups ($P>0.05$). The visual acuity of 400 patients after the operation was significantly higher than that before operation ($P<0.05$). The operation and other costs in the poor group were lower than those of the non-poor group ($P<0.05$). The elimination rate of disability in the non-poor group was significantly higher than in the poor group ($P<0.05$). Multivariate regression analysis showed that the level of the hospital, the location of the treatment institution, living alone, education level, and the number of visits were factors affecting the self-rated treatment effect of patients ($P<0.05$). Conclusion: The self-rated treatment effect of elderly indigent cataract in rural Ganzi Prefecture was closely related to the level of the hospital, the location of treatment institutions, living alone, education level, and the number of visits. Health poverty alleviation programs should be strengthened.

Keywords: Advanced age, countryside, poverty, cataract, self-evaluation of treatment effect, diagnosis and treatment

Introduction

Cataract is the most common blinding eye disease in the world, and the World Health Organization reports that the number of people blinded by cataract is about 20 million worldwide, with a higher incidence in low-income countries and a year-on-year increase. It is expected that the number of blind people may reach 50 million by 2050 [1, 2]. In recent years, the burden of cataract disease in China has been growing rapidly, with data from the

Chinese Medical Association's Ophthalmology Branch showing that the prevalence of cataract among those aged 60 to 89 years is about 80%, and that among the population of 90 years old or above is as high as 90%. Cataract is also the number one eye disease causing blindness in China, with 66.9% (about 3.6 million) of the approximately 5.4 million people aged 50 years or older who are blind in China having cataract(s) [3]. The prevalence of and blindness rate caused by cataract in rural lowland areas of China is higher than that in urban areas, espe-

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cially for cataract patients from poor families who are less able to obtain timely treatment due to financial constraints, increasing the blindness rate and therefore causing poverty and returning to poverty due to the disease, increasing the public health burden and economic pressure on families and society [4]. With the promotion of the Chinese health poverty alleviation project, and the development of the “Brightness Poverty Alleviation Project” and other related projects in the Ganzi region, treatment has been expanded for cataract patients in rural poor areas. Paying attention to the consultation behavior and treatment outcomes of rural elderly poor cataract patients enables their motivation to escape from poverty and prevents returning to poverty due to this disease. It is noted that subjective health self-assessment is considered by several scholars as a validated and robust health assessment with high reliability and validity, that can effectively reflect efficient and comprehensive indicators of individual’s health status, and can be regarded as an indicator to evaluate post-treatment quality of life and prognosis in cataract patients [5, 6]. However, there are insufficient data on the self-assessment of treatment outcome in cataract patients and a lack of multi-center large sample related studies. In this study, we focused on this evaluation index of self-assessment of treatment outcome by analyzing regional data to explore the relationship between self-assessment of treatment outcome and treatment of poor elderly cataract patients in the Ganzi region, to provide a reference for future cataract health poverty governance.

Data and methods

Study subjects

A retrospective study was conducted in elderly cataract patients admitted in Ganzi Prefecture from March 2018 to November 2021. 495 rural patients with documented indigent economic condition were classified as the poor group, including 400 who received surgical treatment and 95 who did not. Another 318 non-poor patients were classified as the non-poor group. The poor population was defined as the registered households receiving relief fund (hereinafter referred to as “minimum living security”) in the Civil Affairs Department. The people who do not enjoy the minimum living allowance were regarded as non-poor people. This study was

approved by the Ethics Committee of Chengdu Fifth People’s Hospital.

Inclusion criteria for the poor group: (1) Patients met the diagnostic criteria in American Clinical Guidelines for Ophthalmology [7]. (2) Patients with clear consciousness. (3) Patients with complete clinical information. (4) Patients with an age of ≥ 80 years.

Exclusion criteria for the poor group: (1) Those with organic disease and abnormal coagulation function. (2) Contraindications to surgery. (3) Ophthalmic diseases other than cataract that cause vision loss. (4) History of previous eye surgery. (5) Abnormal cognitive function, mental illness, inability to express their feelings clearly.

Inclusion criteria for the non-poor group: (1) Patients meeting the diagnostic criteria for cataract disease in the Clinical Guidelines in Ophthalmology - 3rd Edition (American Academy of Ophthalmology) [7] with indications for surgery. (2) The patient was conscious and could communicate normally. (3) Patients with complete clinical profile. (4) Patients with an age ≥ 80 years.

Exclusion criteria for the non-poor group: (1) Those with organic disease and coagulation abnormalities. (2) Ophthalmic diseases other than cataract causing vision loss. (3) Those with a history of previous ocular surgery. (4) Those with traumatic eye disease, long-term eye medication, or macular and retinal pathology. (5) Those with abnormal cognitive function, mental illness or inability to express their feelings clearly.

Basic patient information

Based on the information in the visit records, basic demographic characteristics including patient’s gender, age, education level, residence status, and whether they had comorbid diseases were collected. Basic medical visit information were obtained including whether surgical treatment was performed, the level of the hospital visited, the location of the treatment institution, and the number of visits from March 2018 to November 2021.

Self-assessment of treatment outcome

Self-assessment of treatment effect was collected and archived before the patient’s dis-

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charge or at the end of treatment. Patients were asked to rate themselves according to their health and treatment statuses, with the corresponding options being “cured”, “improved”, “long-term rehabilitation”, “in treatment”, “death” (excluded in subsequent analyses). The above-mentioned indicators were self-ratings and changes that reflected the individual’s judgement and prediction of the severity of the disease and recovery, which cannot be evaluated by medical means. The aim of this study was to examine whether the condition had improved after the treatment, so the self-assessment results were classified into three variables and codes, including 0 for “cured”, 1 for “improved” and 3 for “long-term rehabilitation” and “in treatment”.

Effectiveness of surgical treatment

The preoperative and 1-week postoperative visual acuity of the surgically treated patients in the poor group was examined using the international common visual acuity scale; the elimination rate of blindness and the elimination rate of disability in the non-poor group were compared to those in the poor group. Surgical cost, including: total cost, medication cost, surgery cost, consumables, and examination fee, was recorded. Blindness elimination: postoperative visual acuity ≥ 0.5 ; disability elimination: postoperative visual acuity ≥ 0.3 .

Control of confounding factors

Previous studies have reported age, gender, literacy, and occupation as factors affecting cataract treatment outcome [8, 9], while age and literacy are closely related to cataract development [10], thus, the above factors were controlled for as confounding factors in this study. In the subjective self-assessment of treatment outcome, objective health status was also controlled to reduce bias in the results, as different objective health conditions have a significant effect on the degree of fundus lesions, which is not conducive to recovery of vision after treatment.

Statistical analysis

GraphPad Prism 9.0 was used for figure rendering, and SPSS 26 software was used for statistical analysis. The measured data conforming to normal distribution were expressed by mean \pm SEM, independent sample t-test was

used for comparison of measurement data between groups, and paired t-test was used for comparison within groups. Counted data were expressed using the number of cases/percentage (n/%), and were compared by χ^2/Z test, and the continuity-corrected χ^2 test was used when the theoretical frequency in the chi-square test was less than 5. Descriptive analyses of the basic demographic characteristics of the sample, treatment, and self-rated treatment effects were performed, and the χ^2 test was used for univariate analysis of ordered variables. Multifactor logistic regression analysis model was used to adjust for confounding factors, and ordered multifactor unconditional logistic regression analysis was performed, with $\alpha = 0.05$ as the test level.

Results

Basic demographic characteristics, treatment and self-assessed treatment effects of the poor group

The self-assessed cure and improvement rate of 495 patients in the poor group was 78.79%, of which 58.18% were seen in secondary hospitals, 80.61% were seen in the county, 400 (80.81%) had received cataract surgery and 81.41% had one visit from March 2018 to November 2021, the results are shown in **Table 1**.

Comparison of the results of cataract surgery and treatment for patients in the poor group

All 400 surgically treated patients in the poor group had significantly higher visual acuity 1 week after surgery than before surgery (all $P < 0.05$), see **Table 2** and **Figure 1**.

Comparison of basic demographic characteristics, treatment and self-assessed treatment effects between two groups

There was no significant difference in general data between the poor group (only surgical patients) and the non-poor group ($P > 0.05$), as shown in **Table 3**.

Analysis of the cost of cataract surgery in the two groups

The cost of surgery and other costs were lower in the poor group than in the non-poor group (all $P < 0.05$), as shown in **Table 4** and **Figure 2**.

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Table 1. Basic demographic characteristics, treatment, and self-assessed treatment effects of the poor group ($n = 495$)

Variable	Number of cases (cases)	Percentage (%)
Gender		
Male	232	46.87
Female	263	53.13
Age (years)		
80-85	213	43.03
86-90	238	48.08
91-95	32	6.47
≥ 95	12	2.42
Literacy		
Illiterate or semi-literate	187	37.77
Elementary school	221	44.65
Junior high school and above	87	17.58
Living alone or not		
Yes	81	16.36
No	414	83.67
Are you suffering from other diseases		
Yes	108	21.82
No	387	78.18
Surgical treatment		
Yes	400	80.81
No	95	19.19
Hospital level		
Tertiary hospital	86	17.37
Level 2 hospital	288	58.18
Level 1 Hospital	74	14.95
Primary health institution	47	9.50
Place of treatment		
Within the county	399	80.61
Outside the county	96	19.39
Number of visits from March 2018-November 2021		
1 visit	403	81.41
2 times	83	16.77
≥ 3 times	9	1.82
Self-assessed treatment effect		
Cured	257	51.92
Condition improved	133	26.87
Treatment required	105	21.21

group was significantly higher than that of the poor group ($P < 0.05$), as shown in **Table 5**.

Univariate analysis of factors affecting self-rated treatment outcomes in patients of poor group

The univariate analysis showed that differences in education level, whether they lived alone, whether they suffered from other diseases, the level of the hospital visited, the territory of the treatment institution, and the number of visits from March 2018 to November 2021 were significant among the patients who were cured, improved, or needed treatment in the self-assessed treatment effect (all $P < 0.05$); while the differences in other variables were not significant among the patients with different self-assessed outcomes (all $P > 0.05$), see **Table 6**.

Multi-factor unconditional logistic regression analysis of factors affecting self-rated treatment outcomes of cataract patients in the poor group

Using the self-rated treatment effect as the dependent variable (needed to continue treatment

= 0, improved = 1, cured = 2), the multi-factor regression analysis showed that the level of the hospital visited, the location of the treatment facility, whether the patient lived alone, the level of education, and the number of visits were important factors affecting the patients' self-rated treatment outcomes (all $P < 0.05$), as shown in **Table 7**.

Comparison of the elimination rate of blindness and elimination rate of disability between the two groups

There was no statistical difference in the elimination rate of blindness between the poor group and the non-poor group ($P > 0.05$); the elimination rate of disability in the non-poor

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Table 2. Comparison of the results of cataract surgery and treatment in the poor group ($n = 400$)

Time	Visual acuity <0.05	$0.05 \leq$ Visual acuity <0.3	$0.3 \leq$ Visual acuity <0.5	Visual acuity ≥ 0.05
Pre-operative	238 (59.50)	133 (33.25)	20 (5.00)	9 (2.25)
1 week after surgery	14 (3.50)	57 (14.25)	34 (8.50)	295 (73.75)
Z	502.206			
P	<0.001			

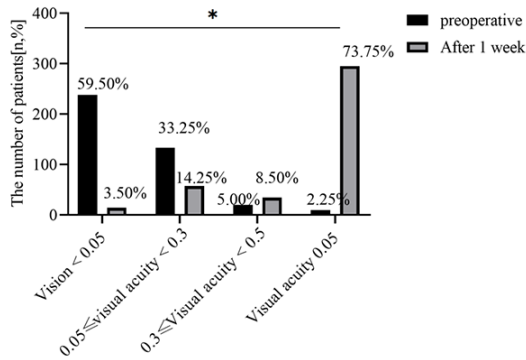


Figure 1. Comparison of cataract surgical treatment outcome in the poor group ($*P < 0.05$).

Discussion

Cataract is the most common blindness-causing eye disease in China, and most of the patients from poor families cannot be treated in time due to economic constraints. Recently, with the implementation of the “Brightness Poverty Alleviation Project” in China, a large number of cataract patients are being treated in the Ganzi area every year. Authoritative data on their treatment effect, visual acuity change, and complications are uncertain. The subjective perception and evaluation of cataract patients on the treatment and rehabilitation effects are crucial, and the current relevant studies in this area focus on national or characteristic diseases and lack regional representative studies, so this study investigated the self-assessed treatment effects of rural senior cataract patients in the Ganzi area.

In this study, the consultation rate in secondary hospitals was 58.18%, and the consultation rate in the county was 80.61%. 400 cases (80.81%) had received cataract surgery, and the number of consultations of 1 from March 2018 to November 2021 accounted for 81.41%. Rural elderly cataract patients who were indigent were mainly in secondary hospitals and basically completed the consultation

and treatment in the county. The reasons for this are mainly due to the lack of financial support, transportation, and disease awareness among those population, which affects their choice of medical treatment when facing major diseases, as described by Hashemi and Belda et al. [11, 12]. At the same time, the aforementioned access is also closely related to the preferential policies for access to health care in the Ganzi region under the health poverty alleviation project. Surgery is currently recognized as the preferred treatment option for cataract, and surgical treatment for patients who meet the surgical indications can save vision and reduce the blindness rate. Atik et al. showed that more frequent treatment visits in a certain time period correlated with a more difficult treatment and slower recovery [13]. In the present study, all 400 surgically treated patients had significantly higher visual acuity 1 week after surgery than before surgery (all $P < 0.05$), and there was no statistical difference in the elimination rate of blindness between the poor and non-poor groups ($P > 0.05$). The elimination rate of disability in the non-poor group (93.08%) was significantly higher than that of the poor group (86.50%) ($P < 0.05$), which was slightly lower than that of cataract patients in previous studies who received surgery. However, the study also reflected that the effect of the “Brightness and Poverty Alleviation Project” on the treatment of elderly cataract patients in rural areas was improved, which verified the above analysis that patients with surgical treatment had better postoperative recovery. The decrease in the postoperative detachment rate may be related to the cost of medical care, and the high cost of medical care reflects the high quality of medical services provided to patients [14, 15]. In this study, surgical and other costs were lower in the poor group than in the non-poor group (all $P < 0.05$), suggesting that higher medical costs in non-poor cataract surgery patients resulted in greater marginal health gains.

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Table 3. Comparison of basic demographic characteristics, treatment and self-assessed treatment effects between the two groups

General data	Poor group (n = 400)	Non-poor group (n = 318)	χ^2	P
Gender				
Male (n, %)	186 (46.50)	134 (42.14)	1.364	0.243
Female (n, %)	214 (53.50)	184 (57.86)		
Age (years old)	85.96±3.99	85.56±3.71	1.376	0.169
Degree of education				
Illiterate or semi-illiterate	150 (37.50)	94 (29.56)	5.572	5.572
Primary school	181 (45.25)	155 (48.74)		
Junior high school and above	69 (17.25)	69 (21.70)		
Other disease				
Hypertension	25 (6.25)	20 (6.29)	0.018	0.894
Diabetes	18 (4.50)	14 (4.40)	0.004	0.950
Hyperlipidemia	21 (5.25)	15 (4.72)	0.274	0.600
Coronary heart disease	16 (4.00)	19 (5.97)	1.490	0.222
Rheumatoid arthritis	1 (0.25)	2 (0.63)	0.611	0.434
Serious mental disorder	1 (0.25)	0 (0.00)	0.796	0.372
Residence				
Live with family	335 (83.75)	276 (86.79)	1.293	0.255
Live alone	65 (16.25)	42 (13.21)		
Hospital level				
First-level	61 (15.25)	39 (12.26)	6.434	0.092
Second-level	234 (58.50)	215 (67.61)		
Third-level	66 (16.50)	42 (13.21)		
Primary health centers	39 (9.75)	22 (6.92)		
Territory of treatment institution				
Within the county	322 (80.50)	241 (75.79)	2.326	0.127
County extraterritorial	78 (19.50)	77 (24.21)		
Number of visits from March 2018 to November 2021				
Once	326 (81.50)	256 (80.50)	10.793	0.05
Twice	69 (17.25)	45 (14.15)		
More than twice	5 (1.25)	17 (5.35)		
Self-assessment of therapeutic effect				
Cure	207 (51.75)	187 (58.80)	4.550	0.103
Be better	110 (27.50)	82 (25.79)		
Need treatment	83 (20.75)	49 (15.41)		

Table 4. Analysis of cataract surgery costs for patients in the two groups (Yuan)

Group	Number of cases	Total Costs	Drugs	Surgical Fees	Consumables	Examination Fees
Poor group	400	1804.6±508.1	93.8±32.4	1150.2±342.5	320.8±86.3	249.7±75.8
Non-poor group	318	6484.4±3641.3	288.8±140.2	1503.1±479.9	3090.0±1972.9	1752.1±1067.1
t		25.399	26.931	11.482	28.043	28.216
P		<0.001	<0.001	<0.001	<0.001	<0.001

Individual subjective health self-assessment is a robust health measure, that can be used as a predictor of a patient's prognosis and quality of life [16]. In this study, we found that the self-assessed cure and improvement rate of 495

patients was 78.79%, which was lower than the self-assessed cure and improvement rate of 90.0% reported by Cui et al. [17] in rural poor cataract patients aged ≥60 years. The reasons may be related to the age of the patients in this

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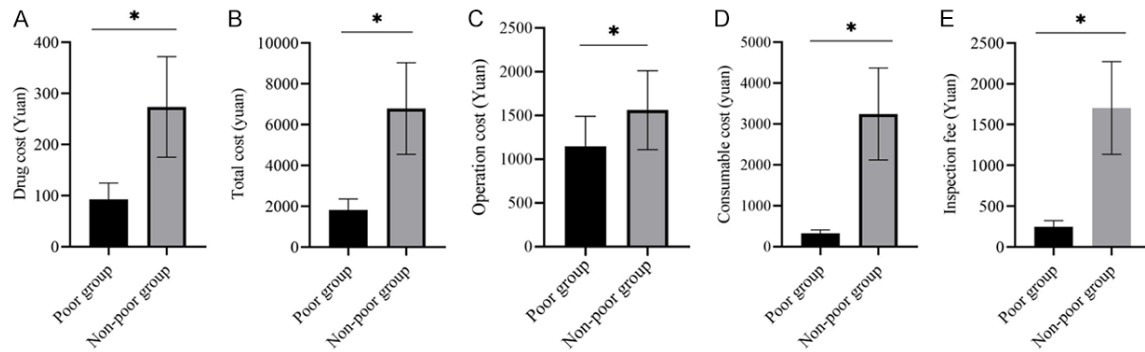


Figure 2. Analysis of cataract surgery cost between the two groups (* $P < 0.05$). A. The comparison of drug cost; B. The comparison of Total cost; C. The comparison of Operation cost; D. The comparison of Consumable cost; E. The comparison of Inspection fee.

Table 5. Comparison of elimination rate of blindness and elimination rate of disability between the two groups [n (%)]

Group	Number of cases	Elimination rate of blindness	Elimination rate of disability
Poor group	400	295 (73.75)	386 (86.50)
Non-poor group	318	251 (78.93)	296 (93.08)
χ^2	-	2.610	7.268
P	-	0.106	0.007

study being advanced (≥ 80 years old) and the Ganzi region being a high-altitude area, where cataract occurs 5-10 years earlier compared to inland areas due to the effects of hypoxia and strong radiation [18]. Cataract patients have declining organ function with age, decreasing corneal endothelial number, cellular status and function, and increasing sensitivity to therapeutic damage, thus affecting patients' self-assessed treatment outcome [19].

Age, gender, literacy, and occupation were found to be risk factors affecting the treatment outcome of cataract patients [20]. In the present study, multi-factor regression analysis showed that the level of the hospital visited, the place of origin of the treatment facility, whether the patient lived alone or not, the level of education, and the number of visits were significant factors influencing the self-rated treatment outcome of patients (all $P < 0.05$). Age and gender were not related to the self-rated treatment outcome of elderly poor cataract patients in rural Ganzi area. This might be because older age did not have a significant effect on self-perception. In terms of consultation, hospital level, and structural affiliation influenced patients' self-rated treatment outcome, which may be related to the better care

rendered by high-level hospitals. It was found that patients with out-of-county medical visits tended to have better self-rated treatment outcomes due to the spatial feasibility and economic conditions of their health service utilization [21]. However, the vast majority of rural elderly cataract patients with poor financial condition stay in county for treatment, as cataract patients in poor rural areas have lower demand for medical care and less medical awareness. Patients who live alone have poor self-rated treatment outcomes, while non-solitary patients can enjoy family care after treatment, receive family support, and improve their treatment-cooperative behavior to promote recovery. The education level is closely related to the self-assessed treatment effect, and the self-assessed treatment effect decreases in those with higher level of education, probably due to the differences in the perceived ability of this group of elderly people because they have more correct knowledge of the disease and have higher requirements for recovery [22]. In terms of the number of treatments, the difficulty of treatment and the increase in the number of visits during treatment, as analyzed in the previous paper, were not conducive to the evaluation of the self-assessed treatment effect of patients.

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Table 6. Univariate analysis of self-rated treatment outcomes of cataract patients in the poor group

Variable	Cured (n = 257)	Condition improved (n = 133)	Treatment required (n = 105)	χ^2	P
Gender					
Male	121 (24.44)	62 (12.53)	49 (9.89)	0.009	0.995
Female	136 (27.47)	71 (14.34)	56 (11.31)		
Age (years)					
80-85	116 (23.43)	53 (10.71)	44 (8.89)	11.875	0.064
86-90	128 (25.86)	64 (12.93)	46 (9.29)		
91-95	10 (2.02)	12 (2.42)	10 (2.02)		
≥95	3 (1.02)	4 (0.81)	5 (1.01)		
Literacy					
Illiterate or semi-literate	56 (11.31)	33 (6.67)	98 (19.79)	183.946	<0.001
Elementary school	154 (31.11)	62 (12.53)	5 (1.01)		
Junior high school and above	47 (9.49)	38 (7.68)	2 (0.40)		
Living alone or not					
Yes	19 (3.39)	15 (11.29)	47 (44.76)	79.497	<0.001
No	238 (4.08)	118 (23.84)	58 (11.72)		
Are you suffering from other diseases					
Yes	43 (8.69)	19 (3.84)	46 (9.29)	38.091	<0.001
No	214 (43.23)	114 (23.03)	59 (11.92)		
Is surgical treatment					
Yes	207 (41.82)	110 (22.22)	83 (16.77)	0.530	0.767
No	50 (10.10)	23 (4.65)	22 (4.44)		
Hospital level					
Tertiary hospital	26 (5.25)	32 (6.46)	28 (5.66)	62.846	<0.001
Level 2 hospital	189 (38.18)	60 (12.12)	39 (7.88)		
Level 1 Hospital	32 (6.46)	25 (5.05)	17 (3.43)		
Primary health institution	10 (2.02)	16 (3.23)	21 (4.24)		
Place of treatment					
Within the county	208 (42.02)	94 (18.99)	97 (19.60)	17.718	<0.001
Outside the county	49 (9.90)	39 (7.88)	8 (1.62)		
Number of visits from March 2018-November 2021					
1 visit	239 (48.28)	122 (24.65)	42 (8.48)	151.695	<0.001
2 times	17 (3.43)	9 (1.82)	57 (11.52)		
≥3 times	1 (0.20)	2 (0.40)	6 (1.21)		

Conclusion

The surgical treatment of cataract better restored vision. The cost of surgery and other costs decreased significantly after state support. The rate of disability removal increased, and the self-assessed treatment outcome of rural elderly indigent cataract patients in Ganzi was closely related to the level of the hospital visited, the location of the treatment institution, whether they lived alone, their education level, the number of visits, and other treatment

conditions. This study is important for promoting the “Brightness and Poverty Alleviation Project” and providing health care protection in poor rural areas of Ganzi. However, there are some shortcomings in this study: first, there are many poor areas in Ganzi, and senior cataract patients are generally not well educated, so the outcome variable of patients’ competent treatment may have some bias. Second, the data of patients’ socio-economic variables were not collected at the time of consultation, so there may be confounding factors missed in this

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Table 7. Multi-factor unconditional logistic regression analysis of self-rated treatment outcomes of cataract patients in the poor group (n = 495)

Variable	Estimated Value	Standard error	Wald chi-square	P	OR	95% CI
Educational level						
Illiterate or semi-literate						1.00
Primary school	0.983	0.283	12.065	0.001	2.672	1.535-4.654
Junior high school and above	1.023	0.358	8.166	0.004	2.782	1.379-5.611
Live alone						
Yes	0.923	0.213	18.778	0.000	2.517	1.658-3.821
no						1.00
Have other diseases						
Yes	0.234	0.316	0.548	0.459	1.264	0.680-2.348
no						1.00
Hospital level						
Tertiary hospital						1.00
Secondary hospital	1.092	0.183	35.608	0.000	2.980	2.082-4.266
First class hospital	0.984	0.219	20.188	0.000	2.675	1.742-4.109
Primary health institutions	0.832	0.217	14.700	0.000	2.298	1.502-3.516
Territory of treatment facility						
within the county						1.00
Outside the county	0.983	0.183	28.854	0.000	2.672	1.867-3.825
Number of visits from March 2018 to November 2021						
1 time						1.00
2 times	1.293	0.472	7.504	0.006	3.644	1.445-9.190
≥3 times	1.182	0.231	26.182	0.000	3.261	2.074-5.128

study. These shortcomings remain to be further studied in the future.

Disclosure of conflict of interest

None.

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