中山大學 中山眼科中心 ZHONGSHAN OPHTHALMIC CENTER, SUN YAT-SEN UNIVERSITY

Contents lists available at Lighthouse Scholar

EYE SCIENCE

journal homepage: journal.gzzoc. com

doi: 10.12419/es24121903
View this article at: https://dx.doi.org/10.12419/es24121903

· Original Article ·

Causes and factors associated with vision impairment in the elderly population in Mangxin town, Kashgar region, Xinjiang, China

Lingling Chen (陈玲玲)[#1], Ruilian Liao (廖瑞莲)[#1], Yuanyuan Liu (刘媛媛)[#2], Ling Jin (金玲)[1], Jun Fu (符君)[1], Xun Wang (王珣)[1], Hongwen Jiang (蒋红文)[3], Lin Ding (丁琳)[4], Qianyun Chen (陈倩韵)[1]

1. State Key Laboratory of Ophthalmology, Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangdong Provincial Key Laboratory of Ophthalmology and Visual Science, Guangdong Provincial Clinical Research Center for Ocular Diseases, Guangzhou 510060, China
2. Kashgar Region Yengisar County People's Hospital, Urumqi Municipality 830001, China
3. Kashgar Regional First People's Hospital, Kashgar 844000, China
4. People's Hospital of Xinjiang Uygur Autonomous Region, Kashgar 844000, China

HIGHLIGHTS

- This study discovered that the overall prevalence of visual impairment among the elderly aged 60 and above in Mangxin Town was 13.21%, with cataract being the primary cause, accounting for 68.20% of cases.
- **Comprehensive Sampling and Examination:** A cross - sectional study was done on 1, 311 elderly (≥60 years old) in Mangxin Town. A comprehensive eye exam, including uncorrected and best - corrected visual acuity, slit - lamp biomicroscopy, OCT, and fundus photography, was carried out. This provided data for analyzing visual impairment prevalence and causes.
- **Multidisciplinary Team and Standardized Procedures:** A 10 - member ophthalmic team and 2 local village doctors conducted the investigation. Team members from different institutions brought diverse expertise. The team was trained for a week, and all exams followed SOPs. Data was entered into an EDC system and reviewed for accuracy, ensuring reliable results..
- The study findings can be used to develop targeted interventions to improve ocular health among the elderly in the region.

Abstract: **Objective:** This study aimed to investigate the prevalence, causes, and influencing factors of vision impairment in the elderly population aged 60 years and above in Mangxin Town, Kashgar region, Xinjiang, China. Located in a region characterized by intense ultraviolet radiation and arid climatic conditions, Mangxin Town presents unique environmental challenges that may exacerbate

Received date: 2024-12-19; **Revised date:** 2025-01-13; **Accepted date:** 2025-01-24; **Published online:** 2025-03-11

# These authors contributed equally to this work.

Corresponding author: Qianyun Chen, E-mail: chenqianyun@gzzoc.com; Xun Wang, E-mail: wangxun@gzzoc.com; Hongwen Jiang, E-mail: 1569655899@qq.com; Lin Ding, E-mail: Dinglin85600@163.com.

Full Text

ocular health issues. Despite the global emphasis on addressing vision impairment among aging populations, there remains a paucity of updated and region-specific data in Xinjiang, necessitating this comprehensive assessment to inform targeted interventions. **Methods:** A cross-sectional study was conducted from May to June 2024, involving 1,311 elderly participants (76.76% participation rate) out of a total eligible population of 1,708 individuals aged ≥60 years. Participants underwent detailed ocular examinations, including assessments of uncorrected visual acuity (UVA) and best-corrected visual acuity (BCVA) using standard logarithmic charts, slit-lamp biomicroscopy, optical coherence tomography (OCT, Topcon DRI OCT Triton), fundus photography, and intraocular pressure measurement (Canon TX-20 Tonometer). A multidisciplinary team of 10 ophthalmologists and 2 local village doctors, trained rigorously in standardized protocols, ensured consistent data collection. Demographic, lifestyle, and medical history data were collected via questionnaires. Statistical analyses, performed using Stata 16, included multivariate logistic regression to identify risk factors, with significance defined as $P < 0.05$. **Results:** The overall prevalence of vision impairment was 13.21% (95% CI: 11.37–15.04), with low vision at 11.76% (95% CI: 10.01–13.50) and blindness at 1.45% (95% CI: 0.80–2.10). Cataract emerged as the leading cause, responsible for 68.20% of cases, followed by glaucoma (5.80%), optic atrophy (5.20%), and age-related macular degeneration (2.90%). Vision impairment prevalence escalated significantly with age: 7.74% in the 60–69 age group, 17.79% in 70–79, and 33.72% in those ≥80. Males exhibited higher prevalence than females (15.84% vs. 10.45%, P = 0.004). Multivariate analysis revealed age ≥80 years (OR = 6.43, 95% CI: 3.79–10.90), male sex (OR = 0.53, 95% CI: 0.34–0.83), and daily exercise (OR = 0.44, 95% CI: 0.20–0.95) as significant factors. History of eye disease showed a non-significant trend toward increased risk (OR = 1.49, $P = 0.107$). Education level, income, and smoking status showed no significant associations. **Conclusions:** This study underscores cataract as the predominant cause of vision impairment in Mangxin Town's elderly population, with age and sex as critical determinants. The findings align with global patterns but highlight region-specific challenges, such as environmental factors contributing to cataract prevalence. Public health strategies should prioritize improving access to cataract surgery, enhancing grassroots ophthalmic infrastructure, and integrating portable screening technologies for early detection of fundus diseases. Additionally, promoting health education on UV protection and lifestyle modifications, such as regular exercise, may mitigate risks. Future research should expand to broader regions in Xinjiang, employ advanced diagnostic tools for complex conditions like glaucoma, and explore longitudinal trends to refine intervention strategies. These efforts are vital to reducing preventable blindness and improving quality of life for aging populations in underserved areas.

Keywords: Low vision; blindness; vision impairment; elderly; Xinjiang; cataract

Cite this article as: Chen LL, Liao RL, Liu YY, Jin L, Fu J, Wang X, Jiang HW, Ding L, Chen QY. Causes and factors associated with vision impairment in the elderly population in Mangxin town, Kashgar region, Xinjiang, China. Eye Science, 2025, 2(1): 12-24. doi: 10.12419/es24121903.

INTRODUCTION

Vision impairment, which encompasses both blindness and low vision, represents a significant global public health challenge, particularly among aging populations. It not only detracts from the quality of life of the elderly but also increases mortality risks.[1-4] According to the 2019 Global Burden of Disease (GBD) Study, approximately 4.91 million people worldwide are blind, 253 million experience moderate vision impairment, and 33.78 million suffer from severe vision impairment.[5] The World Health Organization (WHO) estimates that at least 2.2 billion people globally are affected by vision problems, with at least 1 billion cases being preventable or untreated.

In China, the issue of vision impairment among the elderly population is becoming increasingly prominent due to the aging of the population. By 2019, about 0.48% of the population was blind, 2.57% had moderate vision impairment, and 0.25% experienced severe impairment.[6] China has approximately 6.7 million blind individuals, accounting for 18% of the global blind population and make a significant contributing to the global disease burden. The main cause of vision impairment in China, includes cataract, glaucoma, diabetic retinopathy, myopia, maculopathy, age-related macular degeneration, and corneal diseases.[7-9]

The prevalence of vision impairment varies according to socioeconomic conditions and access to healthcare. A survey conducted in 2009 across nine provinces in China revealed significant regional differences in the prevalence of low vision(ranging from 3.13% to 9.51%), and blindness (ranging from 0.74% to 4.95%).[10] For example, in Changji City, Xinjiang, the prevalence of blindness is 0.74%, while 3.83% of the population experiences vision impairment.[11] Despite the unique geographical and climatic conditions in Xinjiang that may impact ocular health, current data on the elderly population are limited and outdated. Therefore, this study aims to provide updated information on the prevalence, causes, and risk factors of blindness and low vision among the elderly in Mangxin Town, Kashgar region, Xinjiang, China

MATERIALS AND METHODS

A cross-sectional study was conducted from May to June 2024 in Mangxin Town, Kashgar region, Xinjiang, China. Elderly individuals aged 60 years and above were invited to the health center for ophthalmic screening. This study received approval from the Ethics Committee of Zhongshan Ophthalmic Center, Sun Yat-sen University (2024KYPJ009-2).The participants were enrolled after obtaining informed consent.

Sampling

The target population of this survey is individuals aged years 60 and above. In Mangxin Town, the population of individual aged 60 years and above totals 1,708. Subjects who meet the inclusion and exclusion criteria were included in the study. The inclusion criteria are as follows: elderly individuals aged 60 years and above, residing in Mangxin Town, and capable of cooperating with the ophthalmic examination and questionnaire survey. The exclusion criteria are: individuals with severe mental illness or cognitive impairment who are unable to cooperate with the examination, and those with severe systemic diseases in critical condition who are unable to participate in the research.

Measurement

A comprehensive ocular examination was conducted for each participant, including assessments of uncorrected visual acuity (UVA) and best-corrected visual acuity (BCVA). In addition, slit-lamp biomicroscopy, optical coherence tomography (OCT), and fundus photography were performed. For the assessment of UVA, standard logarithmic visual acuity charts were used. The Canon TX-20 Automatic Tonometer was utilized to measure intraocular pressure (IOP), while the Topcon DRI OCT Triton was employed for OCT imaging.

After evaluating visual acuity, intraocular pressure, and performing slit-lamp examinations, mydriatic agents were administered to participants who met the criteria for mydriasis, as determined by an ophthalmologist, prior to conducting a detailed fundus examination. For those who did not meet these criteria, the fundus examination was

carried out with natural, non-dilated pupils. Alongside the ocular assessments, demographic information, medical history, lifestyle factors, and educational background were also collected from each participant.

Data collection

From May to June 2024, a 10-member ophthalmic team, alongside 2 local village doctors, conducted a collaborative investigation at Mangxin Town Health Center. This team comprised professionals from Zhongshan Ophthalmic Center of Sun Yat-sen University, the Ophthalmology Department at Xinjiang Uygur Autonomous Region People's Hospital, and the Mangxin Town Health Center. Essential ophthalmic equipment was transported from Zhongshan Ophthalmic Center, calibrated, and tested for accuracy before use.

The investigation team underwent a week-long training session, followed by a pilot test conducted one month before formal data collection. Ophthalmic examinations were performed in accordance with established Standard Operating Procedures (SOPs). Visual acuity results and demographic information were entered into an electronic data capture (EDC) system by designated personnel, while intraocular pressure measurements, OCT scans, and fundus photographs were directly imported into the system. All data were subsequently reviewed and verified for accuracy.

For each case of vision impairment, ophthalmologists determined the primary cause. In cases where multiple factors contributed to impairment, they identified the main cause.

Definitions

According to the WHO (World Health Organization) standard, definitions of vision impairment are as follows:**Mild vision impairment:** Visual acuity in the better eye is worse than 6/12 but equal to or better than 6/18. **Moderate vision impairment:** Visual acuity in the better eye is worse than 6/18 but equal to or better than 6/60. **Severe vision impairment:** Visual acuity in the better eye is worse than 6/60 but equal to or better than 3/60. **Blindness:** Visual acuity in the better eye is worse than 3/60.

In this article, moderate vision impairment and severe vision impairment are collectively referred to as "low vision". The terms "low vision" and "blindness" are collectively referred to as vision impairment.

Statistical analysis

Statistical analyses were conducted using Stata 16 (StataCorp, College Station TX, USA.). Descriptive statistics were used to summarize the data, including mean, (standard deviation) for continuous variables, and frequency, (percentage) for categorical variables.

To compare age and sex between participants and non-participants, two-sample t tests and chi-squared tests were used, respectively.

Prevalence and 95% confidence interval of vision impairment, low vision and blindness was calculated by different characteristics. The factors associated with vision impairment were explored using multivariate logistic regression analysis including all variables with $P<0.05$ in the univariable analysis. Statistical significance was defined as a P-value less than 0.05.

RESULTS

Study population

In Mangxin Town, the population aged 60 years and above totals 1,708. A total of 1,311 individuals underwent the initial examination, yielding a participation rate of 76.76%. After re-confirming with the local authorities, the main reasons for non-participation can be summarized as follows: 1. The local residents are scattered in their living locations, and some non -participants live in remote areas, making them subjectively unwilling to participate in the study. 2. Some residents have physical inconveniences that objectively prevent them from participating in the study.

No statistically significant differences were found in age or sex between participants and non-participants (Table1).

The mean age of the enumerated population was 68.44 years. Overall, 51.07% were males. Nearly 69.95% (908/1298) of those enumerated had no education (Table 2).

Prevalence of vision impairment (Table 2)

Table 2 presents the prevalence of vision impairment, low vision, and blindness across various

Table 1 Comparisons between participants and non-participants in the distributions of age and sex

Variable	Total (n=1708)	Participant (n=1311)	Non-participant (n=397)	*P*
Age(years), Mean (SD)	68.42 (6.63)	68.44 (6.59)	68.37 (6.75)	0.866*
Age categories, n (%)				0.103†
60-69	1020 (59.79)	781 (59.66)	239 (60.20)	
70-79	572 (33.53)	449 (34.40)	123 (30.98)	
≥80	114 (6.68)	79 (6.04)	35 (8.82)	
Sex, n (%)				0.061†
Male	850 (49.82)	669 (51.07)	181 (45.71)	
Female	856 (50.18)	641 (48.93)	215 (54.29)	

SD: Standard deviation

*Two-sample t test

†Chi-squared test

demographic groups. Among the total sample of 1, 311 participants, the overall prevalence of vision impairment was 13.21% (95% CI:11.37, 15.04), low vision was 11.76% (95% CI:10.01, 13.50), and blindness was 1.45% (95% CI:0.80, 2.10). Significant differences were observed in terms of age and sex. The prevalence of vision impairment, including low vision and blindness, increased with age advances. Specifically, individuals aged 70-79 had a vision impairment prevalence of 17.79% (95% CI: 14.40, 21.18), while those aged 80 or older had a prevalence of 33.72% (95% CI: 24.7, 44.1). Males exhibited a higher prevalence of vision impairment (15.84%, 95% CI: 13.08, 18.61) compared to females (10.45%, 95% CI: 8.08, 12.82), with the difference being statistically significant (*P*=0.004).

Causes of vision impairment (Figure1, Figure2, Figure3)

Cataract was the primary cause of vision impairment, accounting for 68.20% of the cases. Other causes included glaucoma (5.80%), optic atrophy (5.20%), age-related macular degeneration (AMD, 2.90%), retinal vein obstruction (RVO, 2.30%), corneal diseases (1.70%), other ocular fundus diseases (6.40%), and other eye diseases (7.50%). When analyzed separately for blindness and low vision, the results are consistent with vision impairment, with cataract remaining the primary cause (52.63% for blindness and 70.13% for low vision).

Factors associated with vision impairment (Table 3)

Variables with $P < 0.01$ in univariable regression analysis were included in the multivariable model. In the adjusted logistic regression analysis, age, sex, exercise frequency, and history of eye disease were significantly associated with vision impairment. Specifically:Participants aged 70–79 years exhibited 2.725-fold higher odds of vision impairment compared to those aged 60–69 (95% CI: 1.898–3.912, $P < 0.001$), while those aged ≥80 years had 6.430-fold increased odds (95% CI: 3.793–10.902, $P = 0.001$).Female participants demonstrated 47.2% lower odds of vision impairment than males (OR = 0.528, 95% CI: 0.336–0.83, $P = 0.006$). Regular exercise showed a protective effect: individuals exercising daily had 56% reduced odds of vision impairment (OR = 0.44, 95% CI: 0.20–0.95, $P = 0.037$). History of eye disease was associated with 48.7% higher odds of vision impairment in the multivariable analysis; however, this association did not reach statistical

Table 2 Prevalence of vision impairment, low vision and blindness by different characteristics (n=1311)

Characteristics	N(missing)	Vision impairment		Blindness		Low vision	
		n	Prevalence (95% CI)*	n	Prevalence (95% CI)*	n	Prevalence (95% CI)*
All	1311 (0)	173	13.21 (11.37, 15.04)	19	1.45 (0.80, 2.10)	154	11.76 (10.01, 13.50)
Age, years	1311 (0)						
60-69	736	57	7.74 (5.81, 9.68)	7	0.95 (0.25, 1.65)	50	6.79 (4.98, 8.61)
70-79	489	87	17.79 (14.40, 21.18)	10	2.04 (0.79, 3.30)	77	15.75 (12.52, 18.97)
≥80	86	29	33.72(24.7, 44.1)	2	2.53 (0.00, 6.00)	27	31.4(22.6, 41.8)
P value			<0.001		0.355		<0.001
Sex	1310 (1)						
Male	669	106	15.84 (13.08, 18.61)	13	1.94 (0.90, 2.99)	93	13.90 (11.28, 16.52)
Female	641	67	10.45 (8.08, 12.82)	6	0.94 (0.19, 1.68)	61	9.52 (7.24, 11.79)
P value			0.004		0.127		0.014
Education Level	1298 (13)						
No education	908	125	13.77 (11.53, 16.01)	16	1.76 (0.91, 2.62)	109	12.00 (9.89, 14.12)
Educated	390	45	11.54(9.34, 14.95)	3	0.77(0.83, 2.89)	42	10.77(8.60, 13.39)
P value			0.275		0.117		<0.001
Average annual household income (RMB)	1298 (13)						
≤50, 000	1257	167	13.29 (11.41, 15.16)	18	1.43 (0.78, 2.09)	149	11.85 (10.07, 13.64)
>50, 000	41	3	7.32(5.76, 15.82)	1	2.44(5.76, 15.82)	2	4.89 (1.37, 16.12)
P value			<0.001		<0.001		<0.001
Smoking	1298 (13)						
Current smoker	77	6	7.79 (1.80, 13.78)	0	0.00 (0.00, 0.00)	6	7.79 (1.80, 13.78)
Former smoker	95	8	8.42 (2.84, 14.01)	0	0.00 (0.00, 0.00)	8	8.42 (2.84, 14.01)
Never smoke	1126	156	13.85 (11.84, 15.87)	19	1.69 (0.94, 2.44)	137	12.17 (10.26, 14.08)
P value			0.117		0.229		0.306
Dietary	1298 (13)						
Two meals per day	15	1	6.67 (0.00, 19.29)	0	0.00 (0.00, 0.00)	1	6.67 (0.00, 19.29)
three meals per day	1215	163	13.42 (11.50, 15.33)	19	1.56 (0.87, 2.26)	144	11.85 (10.03, 13.67)
Regular three meals per day	12	1	8.33 (0.00, 23.97)	0	0.00 (0.00, 0.00)	1	8.33 (0.00, 23.97)

Table 2 (continued)

Characteristics	N(missing)	Vision impairment		Blindness		Low vision	
		n	Prevalence (95% CI)*	n	Prevalence (95% CI)*	n	Prevalence (95% CI)*
Irregular	56	5	8.93 (1.46, 16.40)	0	0.00 (0.00, 0.00)	5	8.93 (1.46, 16.40)
P value			0.626		0.725		0.815
Exercise	1298(13)						
Every day	528	50	9.47 (6.97, 11.97)	3	0.57 (0.00, 1.21)	47	8.90 (6.47, 11.33)
1-3 times a month	170	23	13.53 (8.39, 18.67)	1	0.59 (0.00, 1.74)	22	12.94 (7.90, 17.99)
1-2 times a week	441	62	14.06 (10.81, 17.30)	7	1.59 (0.42, 2.75)	55	12.47 (9.39, 15.56)
3-5 times a week	96	24	25.00 (16.34, 33.66)	7	7.29 (2.09, 12.49)	17	17.71 (10.07, 25.34)
Rarely/Never	63	11	17.46 (8.09, 26.83)	1	1.59 (0.00, 4.67)	10	15.87 (6.85, 24.90)
P value			<0.001		<0.001		0.062
History of eye disease	1188(123)						
No	1013	124	12.24 (10.22, 14.26)	11	1.09 (0.45, 1.72)	113	11.15 (9.22, 13.09)
Yes	175	35	20.00 (14.07, 25.93)	8	4.57 (1.48, 7.67)	27	15.43 (10.08, 20.78)
P value			0.005		<0.001		0.105
Systemic disease	1188(123)						
No	681	92	13.51 (10.94, 16.08)	10	1.47 (0.56, 2.37)	82	12.04 (9.60, 14.49)
Yes	507	67	13.21 (10.27, 16.16)	9	1.78 (0.63, 2.92)	58	11.44 (8.67, 14.21)
P value			0.882		0.677		0.751

CI: Confidence interval

*Wald confidence intervals was calculated, otherwise as noted.

†Exact confidence intervals was calculated.

Table 3 Logistic regression of potential factors on vision impairment

		Univariable regression		Multivariable regression* (n=1179)	
	N(missing)	OR (95% CI)	P value	OR (95% CI)	P value
Age, years	1311(0)				
60-69	736	Reference		Reference	
70-79	489	2.574(1.803, 3.675)	<0.001	2.725(1.898, 3.912)	<0.001
≥80	86	6.052(3.589, 10.204)	<0.001	6.430(3.793, 10.902)	0.001
Sex	1310(1)				
Male	669	Reference		Reference	
Female	641	0.621(0.448, 0.861)	0.004	0.528(0.336, 0.83)	0.006

Table 3 Logistic regression of potential factors on vision impairment

		Univariable regression		Multivariable regression* (n=1179)	
	N(missing)	OR (95% CI)	P value	OR (95% CI)	P value
Education Level	1298(13)				
No education	908	Reference			
Educated	390	0.816(0.567, 1.174)	0.273		
Average annual household income (RMB)	1298(13)				
≤50, 000	1257	Reference			
>50, 000	41	0.515(0.157, 1.687)	0.273		
Smoking	1298(13)				
Current smoker	77	Reference			
Former smoker	95	1.088(0.361, 3.282)	0.881		
Never smoke	1126	1.905(0.814, 4.458)	0.137		
Dietary	1298(13)				
Two meals per day	15	Reference			
three meals per day	1215	2.171(0.284, 16.623)	0.455		
Regular three meals per day	12	1.273(0.071, 22.72)	0.87		
Irregular	56	1.373(0.148, 12.726)	0.78		
Exercise	1298(13)				
Every day	528	Reference		Reference	
1-3 times a month	170	1.493(0.881, 2.529)	0.137	2.21(1.013, 4.824)	0.046
1-2 times a week	441	1.561(1.05, 2.319)	0.028	1.971(1.143, 3.401)	0.015
3-5 times a week	96	3.18(1.842, 5.491)	<0.001		
Rarely/Never	63	2.018(0.989, 4.116)	0.053	2.925(1.516, 5.643)	0.001
History of eye disease	1188(123)				
No	1013	Reference		Reference	
Yes	175	1.792(1.183, 2.715)	0.006	1.487(0.918, 2.407)	0.107
Systemic disease	1188(123)				
No	681	Reference			
Yes	507	0.975(0.695, 1.367)	0.883		

*Variables with P<0.05 in the univariable regression analysis were included in the multivariable regression analysis.

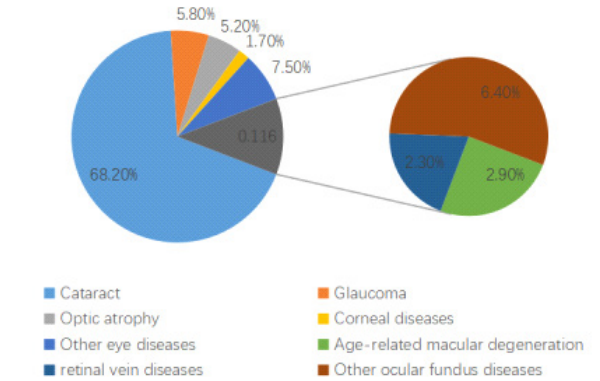

Figure 1 Distribution of principal causes of vision impairment

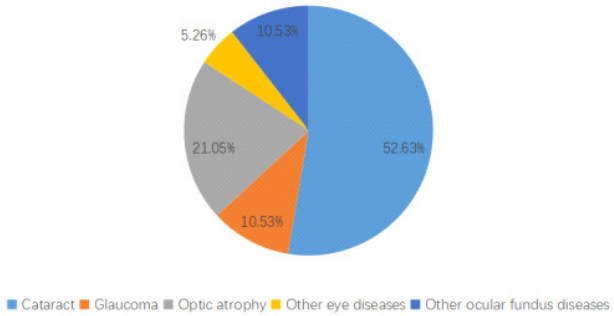

Figure 2 Distribution of principal causes of Blindness

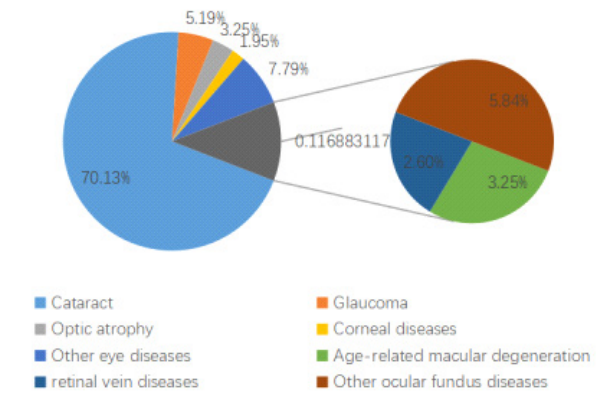

Figure 3 Distribution of principal causes of Low vision

significance (OR = 1.487, 95% CI: 0.918–2.407, $P = 0.107$).

Other variables, including education level, household income, smoking status, and dietary habits, showed no statistically significant associations ($P > 0.05$).

DISCUSSION

In 1999, the WHO launched the Global Initiative for the Elimination of Avoidable Blindness, a strategy known as “Vision 2020: the Right to Sight”and “Sight first, China action” in China.[11] Additionally, the Chinese Thirteenth Five-Year Plan for Eye Health has promoted eye care services for Chinese residents. In a review article published in 2022, we observed that a decreasing trend in the prevalence of blindness (using the WHO definition and based on BCVA) over the past decades, from 3.19 to 1.20%.[12] However, with China’s rapid socioeconomic development and the intensification of population aging, vision impairment remains a significant health problem for the Chinese population.[13] Targeted measures need to be taken to reduce avoidable blindness and vision impairment.

This study selected residents of Mangxin Town to conduct a general screening of ocular diseases, aiming to identify common eye conditions and primary causes of vision impairment among them. This will also facilitate the real-world application of intelligent screening and diagnosis technology for ocular diseases locally, establish an intelligent diagnosis and treatment system, and enable its promotion in multiple regions, thereby contributing to early screening, prevention, and treatment of ocular diseases among the people of Xinjiang.

The findings of this study are consistent with previous research in other regions, highlighting cataract as the leading cause (68.2%) of vision impairment in the elderly populations. The high prevalence of cataract in Xinjiang may be related to the region's strong ultraviolet radiation and dry climate, which can accelerate the aging process of the lens. Surgery remains the main treatment for cataract. Although cataract surgical rate (CSR) in China has developed rapidly, there is still a significant gap compared to many countries globally. According to the report "Cataract Surgical Rate and Socioeconomics: A Global Study, " in 2016,[14] developed countries such as France and the United States had already achieved a CSR of 10, 000, while Australia reached 9, 500, and India surpassed 5, 000. Although China's CSR increased from 1,072 in 2012 to 2,662 in 2018, it still lags behind, indicating substantial room for growth in the future.[15-17]

Fundus diseases emerged as the second cause of vision impairment in the survey, accounting for 11.6% of vision impairment cases, including AMD and RVO and other ocular fundus conditions. In some developed countries and regions, fundus diseases have become the major causes diseases of blindness.[18-19] This may be attributed to the fact that most residents in these area have financial means to address preventable and treatable eye conditions, such as cataract, and benefit from a superior service system. Fundus lesions are closely related to systemic diseases, and with the increasing prevalence of diabetes and hypertension in recent years, fundus complications are on the rise. It is particularly crucial that once eye complications occur and are not treated in time, they may develop into irreversible blindness, severely impacting the quality of life of the elderly population. Therefore, it is suggested to strengthen the development of medical resources at the grassroots level, improve technical proficiency, and enhance patient education.[20]

Glaucoma was the third leading cause of vision impairment in the survey, accounting for 5.8% of cases. According to the WHO estimates, glaucoma has become the second leading cause of blindness globally.[21] Early diagnosis of glaucoma is particularly challenging, and although its prevalence is lower than that of cataract, its visual function damage is irreversible.[22] Furthermore, its prevalence increases with age, significantly affecting the quality of life of the elderly. Due to the limitations of the survey condistions, the specific types of glaucoma could not be clearly defined. If the types of glaucoma incidence can be detailed, it would not only aid ophthalmologists in our district in improving the early diagnosis and treatment of glaucoma but also help formulate localized treatment plans tailored local conditions. This would not only reduce the number of blindness caused by glaucoma in our district but also effectively improve the quality of life of this population.[23]

The fourth leading cause of vision impairment was optic atrophy, which accounted for 5.2% of all vision impairment. Optic atrophy represents a morphological sequel following the degeneration and necrosis of optic nerve fibers due to various etiologies. This condition occurs globally, with incidence varying across different regions and populations. According to literature reports, the prevalence rate of optic atrophy in China is 0.115%, significantly higher than the international average of 0.005-0.01%. With economic development and the intensification of aging society, the incidence of optic atrophy in China is on the rise. Early detection, diagnosis, and treatment are key to preventing optic atrophy.[23-24] Regular eye examinations, maintaining a healthy lifestyle, and actively treating the underlying cause are effective measures to prevent optic nerve atrophy. For patients who have already developed optic atrophy, personalized treatment plans should be developed based on the specific circumstances, with close monitoring of any changes in their condition.

In contrast to the findings of this study, women generally face a higher risk of vision loss and blindness than men globally.[25-28] However, in the Xinjiang region, the number of male blind patients may exceed that of females, indicating a higher prevalence of vision impairment in men.[39] This could possibly due to men engaging in more outdoor work or manual labor, which may expose their eyes to greater stress and damage from intense ultraviolet light .

Age is a significant influencing factor,[27, 30-31] with the risk of vision impairment increasing with age. This is likely attribute to the cumulative effects of ocular aging and the increasing prevalence of age-related ocular diseases.

As people age, the tissues and structures of the eyes gradually degenerate, leading to an increased incidence of eye diseases. Many of these eye diseases can severely impair vision. The significant association between a history of eye disease and vision impairment highlights that individuals with pre-existing eye conditions are at a greater risk of developing more severe vision impairment.[32-34]

There is a notable correlation between exercise frequency and the incidence of disease. This may be attributed to two factors: firstly, regular exercise enhances physical fitness, thereby reducing the likelihood of illness; secondly, vision impairment can restrict patients' activities.[35]

LIMITATION

This study, based on a limited sample size, may be prone to information bias. Furthermore, since the

data is sourced only from Mangxin Town, it may not comprehensively represent the situation across the entire Kashgar region. Future research should aim to expand the sample size and broaden the scope of the survey. To validate the findings of this study, future research should incorporate data from multiple regions and adopt a prospective study design.

Due to the limitations of the examination equipment used in this study, our investigation primarily consisted of a preliminary ocular disease screening. As a result, in-depth and definitive diagnoses, particularly for complex conditions such as fundus diseases, were not always feasible. In future studies, we plan to use more advanced examination equipment. This will facilitate more detailed and accurate diagnoses of diseases like fundus diseases, thereby enhancing the depth and precision of our analyses and making a more significant contribution to ophthalmology research.

CONCLUSION

This study offers valuable insights into the prevalence, causes, and influencing factors of vision impairment among the elderly population in Mangxin Town, Kashgar region, Xinjiang. Cataract was identified as the primary cause, with age, sex, and history of eye disease significantly impacting the risk. Other notable causes of vision impairment included glaucoma, diabetic retinopathy, and age-related macular degeneration. To tackle these issues from a public health standpoint, targeted interventions are imperative. These interventions should focus on improving access to cataract surgery, promoting the use of portable screening technologies for ocular fundus diseases, leveraging artificial intelligence to streamline eye disease screening processes, enhancing health education efforts, and advocating for healthy lifestyles. Furthermore, it is crucial to strengthen the development of grassroots ophthalmology departments and ophthalmic teams. Establishing and refining a network for disseminating appropriate technologies is also vital in bolstering the capacity of eye health services at the grassroots level. Collectively, these measures are aimed at reducing the incidence of blindness and improving ocular health among the elderly population in this region.

Correction notice
None

Acknowledgement
We thank all participants and staff involved in this study.

Author Contributions
(I) Conception and design: Qianyun Chen, Xun Wang, Lingling Chen, Ling Ding, Hongwen Jiang
(II) Administrative support: Qianyun Chen, Xun Wang, Ling Ding, Hongwen Jiang
(III) Provision of study materials or patients: Xun Wang, Lingling Chen, Jun Fu, Yuanyaun Liu
(IV) Collection and assembly of data: Lingling Chen, Xun Wang, Yuanyuan Liu
(V) Data analysis and interpretation: Ling Jin, Ruilian Liao, Lingling Chen
(VI) Manuscript writing: All authors
(VII) Final approval of manuscript: All authors

Funding
The work was supported by Science and Technology Planning Project of Guangzhou City (2024A04J4474).

Conflict of Interests
None of the authors has any conflicts of interest to disclose. All authors have declared in the completed the ICMJE uniform disclosure form.

Patient consent for publication
None

Ethical Statement
This study received approval from the Ethics Committee of Zhongshan Ophthalmic Center, Sun Yat-sen University (2024KYPJ009-2).

Provenance and Peer Review
This article was a standard submission to our journal. The article has undergone peer review with our anonymous review system.

Data Sharing Statement
None

References

1. Brown GC. Vision and quality-of-life. Trans Am ophthalmol soc. 1999, 97: 473–511. DOI: 10.1016/s0002-9394(00)00513-4.
2. McCarty C, Nanjan MB, Taylor H. Vision impairment predicts 5 year mortality. Br J Ophthalmol. 2000, 85: 322-326. DOI: 10.1136/bjo.85.3.322.
3. Ramrattan RS. Prevalence and causes of visual field loss in the elderly and associations with impairment in daily functioning. Arch Ophthalmol. 2001, 119(12): 1788. DOI: 10.1001/archopht.119.12.1788.
4. Leissner J, Coenen M, Froehlich S, et al. What explains health in persons with visual impairment? Health Qual Life Outcomes. 2014, 12: 65. DOI: 10.1186/1477-7525-12-65.
5. GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet. 2020, 396(10258): 1204-1222. DOI: 10.1016/S0140-6736(20)30925-9.
6. Xu T, Wang B, Liu H, et al. Prevalence and causes of vision loss in China from 1990 to 2019: findings from the global burden of disease study 2019. Lancet Public Health. 2020, 5(12): e682-e691. DOI: 10.1016/S2468-2667(20)30254-1.
7. Muñoz B, West SK. Blindness and visual impairment in the Americas and the Caribbean. Br J Ophthalmol. 2002, 86(5): 498-504. DOI: 10.1136/bjo.86.5.498.
8. Bourne RA. Worldwide glaucoma through the looking glass. Br J Ophthalmol. 2006, 90(3): 253-254. DOI: 10.1136/bjo.2005.083527.
9. Bourne R, Steinmetz JD, Flaxman S, et al. Trends in prevalence of blindness and distance and near vision impairment over 30 years: an analysis for the Global Burden of Disease Study. Lancet Glob Health. 2021, 9(2): e130-e143. DOI: 10.1016/S2214-109X(20)30425-3.
10. Zhao J, Ellwein LB, Cui H, et al. Prevalence of vision impairment in older adults in rural China the China nine-province survey. Ophthalmology. 2010, 117(3): 409-416. e1. DOI: 10.1016/j.ophtha.2009.11.023.
11. Resnikoff S, Kocur I, Etya'ale DE, et al. Vision 2020: the right to sight. Ann Trop Med Parasitol. 2008, 102(sup1): 3-5. DOI: 10.1179/136485908x337409.
12. Li C, Zhu B, Zhang J, et al. Epidemiology, health policy and public health implications of visual impairment and age-related eye diseases in mainland China. Front Public Health. 2022, 10: 966006. DOI: 10.3389/fpubh.2022.966006.
13. Guan HJ. Present status and development of prevention of blindness and ophthalmic epidemiologic studies in China. Zhonghua Yan Ke Za Zhi. 2010. 46(10): 938-943.
14. Wang W, Yan W, Fotis K, et al. Cataract surgical rate and socioeconomics: a global study. Invest Ophthalmol Vis Sci. 2016, 57(14): 5872. DOI: 10.1167/iovs.16-19894.
15. Zhu MM, Zhu JF, Zou HD, et al. Analysis of cataract surgical rate and its influencing factors in Shanghai, China. Zhonghua Yi Xue Za Zhi. 2013, 93(47): 3737-3740.
16. Song P, Wang H, Theodoratou E, et al. The national and subnational prevalence of cataract and cataract blindness in China: a systematic review and meta-analysis. J Glob Health. 2018, 8(1): 010804. DOI: 10.7189/jogh.08.010804.
17. Yan W, Wang W, van Wijngaarden P, et al. Longitudinal changes in global cataract surgery rate inequality and associations with socioeconomic indices. Clinical Exper Ophthalmology. 2019, 47(4): 453-460. DOI: 10.1111/ceo.13430.
18. Zhang J, Zhang J, Zhang C, et al. Diabetic macular edema: current understanding, molecular mechanisms and therapeutic implications. Cells. 2022, 11(21): 3362. DOI: 10.3390/cells11213362.
19. Ma C, Li H, Lu S, et al. The role and therapeutic potential of melatonin in degenerative fundus diseases: diabetes retinopathy and age-related macular degeneration. Drug Des Devel Ther. 2024, 18: 2329-2346. DOI: 10.2147/DDDT.S471525.
20. Liu H, et al. General Medical Management of Diabetic Retinopathy. Yan Ke Xue Bao. 2023, 38(04): 350-359. DOI:10.12419/j.issn.1000-4432.2023.04.07
21. Abdull MM, Chandler C, Gilbert C. Glaucoma, "the silent thief of sight": patients' perspectives and health seeking behaviour in Bauchi, northern Nigeria. BMC Ophthalmol. 2016, 16: 44. DOI: 10.1186/s12886-016-0220-6.
22. Jonas JB, Aung T, Bourne RR, et al. Glaucoma. Lancet.

2017, 390(10108): 2183-2193. DOI: 10.1016/S0140-6736(17)31469-1.

23. Zhao JL. Changing the Status of Glaucoma as the Leading Cause of Irreversible Blindness. Yan Ke Xue Bao. 2021. 36(06): 389-392. DOI:10.3978/j.issn.1000-4432.2021.06.08.
24. Bennett JL, Costello F, Chen JJ, et al. Optic neuritis and autoimmune optic neuropathies: advances in diagnosis and treatment. Lancet Neurol. 2023, 22(1): 89-100. DOI: 10.1016/S1474-4422(22)00187-9.
25. Mörchen M, Langdon T, Ormsby GM, et al. Prevalence of blindness and cataract surgical outcomes in Takeo Province, Cambodia. Asia Pac J Ophthalmol (Phila). 2015, 4(1): 25-31. DOI: 10.1097/apo.0000000000000061.
26. Afshari M, Moosazadeh M, Barzegari S, et al. Prevalence of blindness and low vision in Iran: a systematic review and meta-analysis. Ophthalmic Epidemiol. 2018, 25(4): 288-296. DOI: 10.1080/09286586.2018.1451547.
27. Zhao J, Xu X, Ellwein LB, et al. Causes of visual impairment and blindness in the 2006 and 2014 nine-province surveys in rural China. Am J Ophthalmol. 2019, 197: 80-87. DOI: 10.1016/j.ajo.2018.09.011.
28. Eunice Amador Rosa M, Lozano Bustillo A, Espinoza Salvadó I, et al. Prevalence and causes of avoidable blindness in subjects over 50 years of age in Honduras. J Ophthalmic Vis Res. 2022, 17(2): 225-232. DOI: 10.18502/jovr.v17i2.10794
29. Xie YT. Survey of Blindness and Causes Among Uygur Peasants Aged 60 and over in Kuche Country of Xinjiang[D]. Xinjiang Medical University. 2007.
30. Li Y, Huang W, Qiqige A, et al. Prevalence and causes of blindness, visual impairment among different ethnical minority groups in Xinjiang Uygur autonomous region, China. BMC Ophthalmol. 2018, 18(1): 41. DOI: 10.1186/s12886-018-0705-6.
31. Mashige KP, Ramklass SS. Prevalence and causes of visual impairment among older persons living in low-income old age homes in Durban, South Africa. Afr J Prim Health Care Fam Med. 2020, 12(1): e1-e7. DOI: 10.4102/phcfm.v12i1.2159.
32. Selvarajah D, Kar D, Khunti K, et al. Diabetic peripheral neuropathy: advances in diagnosis and strategies for screening and early intervention. Lancet Diabetes Endocrinol. 2019, 7(12): 938-948. DOI: 10.1016/s2213-8587(19)30081-6.
33. Williamson TH. Artificial intelligence in diabetic retinopathy. Eye. 2020, 35(2): 684. DOI: 10.1038/s41433-020-0855-7.
34. De Francesco T, Bacharach J, Smith O, et al. Early diagnostics and interventional glaucoma. Ther Adv Ophthalmol. 2024, 16: 25158414241287431. DOI: 10.1177/25158414241287431.
35. Qin Z, Guo Z, Wang J. Effects of aerobic exercise on balance and mobility in individuals with visual impairment: a systematic review. Disabil Rehabil. 2024, 46(22): 5134-5143. DOI: 10.1080/09638288.2023.2288931.