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# Knowledge and attitude of myope or their guardians toward refractive surgery

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1	Knowledge and attitude of myope or their guardians toward refractive surgery
2	Running title: KA on refractive surgery.
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4	Liqian Mu <sup>1</sup> , Yifeng Qian <sup>2*</sup>
5	<sup>1</sup> Department of General Surgery, the First Affiliated Hospital of Soochow University,
6	Suzhou, China.
7	<sup>2</sup> Department of Ophthalmology, the First Affiliated Hospital of Soochow University, Suzhou,
8	China.
9	
10	*Corresponding author
11	Yifeng Qian
12	Department of Ophthalmology, the First Affiliated Hospital of Soochow University, Suzhou,
13	China.
14	Email: <u>qianyifeng@suda.edu.cn</u>
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19	Abstract
20	Background: Refractive surgery is increasingly popular, yet there is limited understanding of
21	the knowledge and attitudes of myopes or their guardians towards such procedures.
22	Objectives: To investigate the knowledge and attitudes of myopes or their guardians toward
23	refractive surgery.
24	Design: Cross-sectional study.
25	Participants: 581 myopes or their guardians in Suzhou City, Jiangsu Province, China,
26	surveyed between August and October 2022.
27	Interventions: Participants completed a 34-item self-administered questionnaire assessing
28	knowledge and attitudes before and after refractive surgery.
29	Primary and Secondary Outcome Measures: Knowledge and attitude scores, ranging from
30	0 to 45 and 0 to 36, respectively.
31	<b>Results:</b> Post-surgery knowledge ( $32.35 \pm 11.48$ vs. $27.38 \pm 11.74$ , P < 0.001) and attitude
32	$(27.77 \pm 3.505 \text{ vs. } 26.6 \pm 3.267, P < 0.001)$ scores were significantly higher than pre-surgery
33	scores. Participants showed insufficient knowledge but positive attitudes preoperatively, with
34	significant improvements postoperatively. Factors influencing knowledge scores included
35	education level and survey timing, while attitude scores were influenced by knowledge scores,
36	gender, age, registered residence, monthly income, and survey timing (all $P < 0.05$ ).
37	Conclusions: Myopes or their guardians had positive attitudes toward refractive surgery both
38	pre- and postoperatively. Insufficient knowledge preoperatively improved significantly
39	post-surgery, highlighting the importance of educational interventions prior to surgery.
40	Keywords: knowledge, attitude, refractive surgery, myopia, cross-sectional study
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#### Strengths and limitations of this study

Large sample size (581 participants) ensures robust statistical power and generalizability of findings.

Comprehensive assessment of both knowledge and attitudes provides a holistic view of patient perspectives on refractive surgery. 

Study setting in a relatively developed eastern province limits generalizability to other regions with different economic and social conditions.

Use of a self-designed questionnaire may introduce bias and overestimate results, potentially 

overlooking important variables related to knowledge and attitude. 

Refractive error (RE) is one of the most common ophthalmologic disorders among children and adolescents worldwide, including myopia, hyperopia, and astigmatism(1). It is reported that nearly 2.3 billion people live with refractive error in the world, and this number is rising as the prevalence of myopia increases(2). It is well-known that a high rate of myopia occurs in East and Southeast Asian schoolchildren and young adults, with 67.3% of grade 7 children and 83.2% of university students affected in central China(3). More seriously, high or pathologic myopia may result in irreversible visual impairment and even blindness, causing a heavy burden to individuals, families, and society(4).

At present, the main methods of myopia correction include spectacles, contact lenses, and refractive surgery (5). Spectacles have the disadvantages of inconvenience, limited vision, and low resolution, while the use of contact lenses may increase the risk of suffering from conjunctivitis, keratitis, and other eye diseases(6, 7). Compared with spectacles and contact lenses, refractive surgery can be available to correct the refractive error permanently (8). However, in the face of emerging surgical methods, there are both expectations and concerns regarding the procedure and its outcome. A survey conducted among female students in Saudi university indicated that a number of patients may refuse refractive surgery due to the lack of information about correction methods and fear of complications (9). In 2021, another study demonstrated that although refractive surgery was a common surgical procedure, there was little knowledge about this correction method and its complications among medical students (10). According to knowledge, attitudes, and practices (KAP) theory, knowledge is the basis for behavior change, and beliefs and attitudes are the driving force for behavior change (11-13). Therefore, it is helpful to find out and improve the knowledge and attitude of patients or their guardians toward refractive surgery, which may contribute to easing their mental health problems associated with the surgery. 

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We found that previous studies have focused on exploring the efficacy of different control or treatment methods for myopia(14-16), but there is no study evaluating both preoperative and postoperative knowledge and attitude of the Chinese patients or their guardians toward refractive surgery. Accordingly, the purpose of this study was to investigate the knowledge and attitude of the patients or their guardians before and after refractive surgery.

85 Methods

- 86 Patient and public involvement
- 87 No patient involved
- 88 Study design and participants

This cross-sectional study was performed on myope or their guardians between August and October, 2022 in Suzhou city, Jiangsu Province, China. The participants of this study were randomly selected from ophthalmology outpatient and their guardians at the author's Hospital. The inclusion criteria were as follows: 1) those who would undergo refractive surgery or had completed refractive surgery; 2) those who can understand and complete questionnaires; 3) those who volunteer to participate. This study was approved by the Ethics Committee of the author's Hospital. Informed consents were obtained from all the participants. 

97 Procedures

98 Convenience sampling was adopted to select the participants from the Ophthalmology 99 department of the author's Hospital, and then a self-designed questionnaire was used for the 100 investigation. The questionnaire was designed according to the *Ophthalmology (the 9<sup>th</sup>* 101 *version in 2018)* (17) and *Ophthalmic Surgery (the 4<sup>th</sup> version in 2014)* (18), and modified 102 according to the suggestions of two experts. A pilot survey was performed in a small scale 103 (with 50 questionnaires dispatched), and the validity and reliability were assessed. The

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104 Cronbach's alpha (α) of the questionnaire was 0.8547, indicating that the internal consistency
105 of the questionnaire was high (19).

The final questionnaire (Appendix) contained 34 items distributed in 3 dimensions. The dimension for baseline information included 10 items. The knowledge dimension included 15 items, with each correct answer corresponding to 3 point, and 0 point for wrong or unclear answer, and the total score for knowledge was 0-45 points; The attitude dimension included 9 items, and the 5-level Likert scale was used for scoring. The selection of "Highly unaware, or highly agree" for items 1 and 7, was assigned 0 point, the selection of "Unaware, or agree" was assigned 1 point, the selection of "fair, or don't care" was assigned 2 points, the selection of "aware, or disagree" was assigned 3 points, and "Highly aware", or "Highly disagree" was assigned 4 points. For items 2, 3, 4, 5, 6, 8, 9, the scores were assigned contrary to the scores for items 1 and 7. Therefore, the total score of attitude was 0-36 points. In the knowledge domain, less than 70% of the total knowledge score was considered "insufficient knowledge", and more than 70% was "sufficient knowledge". For the attitude score, less than 50% of the total score was considered "negative attitude", 50-70% was "moderate attitude", and more than 70% was "positive attitude". 

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The on-line questionnaire was established by the SoJump APP software on WeChat, and a QR code was generated to allow the data collection through WeChat. The participants scanned the QR code and filled out the questionnaire. To ensure the quality and completeness of the questionnaire survey, each IP was allowed to submit only once, and all the items were mandatory for the participants. The completeness, internal continuity, and rationality of the questionnaires were checked by the investigators.

126 Statistical analyses

127 SPSS 26.0 (IBM Corp., Armonk, N.Y., USA) was used for the statistical analysis.
128 Continuous data were expressed as mean ± standard deviation (SD) and compared by t-test.

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Categorical data were expressed as n (%), and compared by the Chi-square test. ANOVA was used for comparison among multiple groups. Validation factor analysis was conducted to confirm the factorial structure of the designed KAP questionnaire and assess effect size of each item. Several indices indicated a good model fit for the construct, they include: standardized root mean residual (SRMR)  $\leq 0.08$ , root mean square error of approximation (RMSEA)  $\leq 0.08$ , comparative fit index (CFI) > 0.8, Tucker Lewis Index (TLI) > 0.8, and p > 0.05 for the chi-square test. A standardized factor loading greater than 0.5 and a P less than 0.05 indicated a strong relationship between items and their respective factors, thereby confirming the validity of the construct. The multivariate linear regression analysis was conducted to determine the influencing factors of knowledge and attitude. All the statistical analyses were two-sided, and differences with P < 0.05 were considered statistically significant.

# **Results**

A total of 581 participants were recruited for this survey, including 171 males (29.43%) and 410 females (70.47%). Participants were aged 21-30 years old at most (64.03%), registered in more non-agricultural account compared to agricultural account (57.49% vs. 42.51%), and educated mainly in junior college/college (77.28%). Despite the differences in participants' occupations (e.g., government administrators, professionals, clerks), more than 80% of them had average monthly incomes higher than RMB 5,000. Participants' reasons for surgical correction of visual acuity were varied, with the top two being inconvenience in putting up and off the glasses (67.81%) and appearance improvement (40.96%). Notably, the number of individuals surveyed before and after refractive error surgery was different: 164 cases (28.23%) before surgery and 417 cases (71.77%) after surgery. Sociodemographic 

153 characteristics of participants administered the questionnaire before and after surgery were

154 showed in **Table 1**.

**Table 1** Sociodemographic characteristics.

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$			Knowledge score		Attitude score	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		N (%)	Mean $\pm$ SD	p-value	Mean ± SD	p-value
Sex         0.186         0.006           Male         171(29.43)         29.72±12.59         26.78±3.74           Female         410(70.57)         31.45±11.36         27.71±3.32           Age (years)         0.047         0.001 $\leq 20$ 97(16.7)         31.43±12.32         28.59±3.22           21-30         372(64.03)         31.47±11.58         27.25±3.37           >30         112(19.28)         28.78±11.69         27.06±3.82           Registered residence         0.542         0.001           Agriculture account         247(42.51)         30.41±12.24         26.89±3.63           Non-agriculture account         334(57.49)         31.33±1.38         27.85±3.30           Education level         0.001         0.016         0.016           Senior middle school or lower         52(8.95)         23.24±11.95         27.57±3.54           Postgraduate or higher         80(13.77)         32.86±9.833         27.43±3.38           Occupation, N (%)         0.418         0.294           Government administrators of the country or leaders of enterprises and public institutions         24.413)         30.75±10.17         26.08±3.71           Personnel in commercial business or service         68(11.7)         31.54±11.30<	Total score		30.95±11.76		27.45±3.48	
Male         171(29.43)         29.72±12.59         26.78±3.74           Female         410(70.57)         31.43±11.36         27.71±3.32           Age (years)         0.047         0.001 $\leq 20$ 97(16.7)         31.43±12.32         28.59±3.22           21-30         372(64.03)         31.47±11.58         27.25±3.37           >30         112(19.28)         28.78±11.69         27.06±3.82           Registered residence         0.542         0.001         0.016           Agriculture account         234(57.49)         31.33±1.138         27.85±3.30         Education level         0.001         0.016           Senior middle school or lower         52(8.95)         25.44±11.38         26.36±2.81         0.001         0.016           Senior middle school or lower         52(8.95)         25.44±11.38         26.36±2.81         0.294           Government administrators of the county or leaders of enterprises and public institutions         0.418         0.294         0.294           Government in commercial business or service         127(21.86)         32.74±1.060         27.6±3.49           Clerks or relevant personnel         34(5.85)         31.5±11.29         27.05±2.83         Personnel           Personnel in farming, forestry, anima husbandry,	Sex			0.186		0.006
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	21-30	372(64.03)	31.47±11.58		27.25±3.37	
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Education level	551(57.15)	51.55-11.50	0.001	27.00-0.00	0.016
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Senior middle school or lower	52(8.95)	25.44±11.38	0.001	26.36±2.81	0.010
InstructionInstructionInstructionInstructionPostgraduate or higher80(13.77) $32.86\pm9.833$ $27.43\pm3.38$ Occupation, N (%)0.4180.294Government administrators of the country or leaders of enterprises and public institutions $24(4.13)$ $30.75\pm10.17$ $26.08\pm3.72$ Professionals (teachers, engineering technicians, writers, etc.) $127(21.86)$ $32.74\pm10.60$ $27.62\pm3.49$ Clerks or relevant personnel $34(5.85)$ $31.55\pm11.29$ $27.05\pm2.83$ Personnel in commercial business or service $68(11.7)$ $31.54\pm11.30$ $27.85\pm3.22$ Personnel in farming, forestry, animal husbandry, fishery, etc./Imstruction $26.88\pm2.51$ Operators of production or transportation equipment, or relevant personnel $3(0.52)$ $25.33\pm20.10$ $28.66\pm3.21$ Housewife $9(1.55)$ $30.88\pm8.565$ $27.55\pm3.04$ Personnel in medical and relevant industry $27(4.65)$ $33.40\pm13.26$ $28.11\pm4.36$ Others $271(46.64)$ $29.69\pm12.53$ $27.38\pm3.55$ Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ $79(13.6)$ $29.36\pm11.92$ $26.5\pm3.26$ $10000-20000$ $179(30.81)$ $31.97\pm11.75$ $27.43\pm3.55$ $\geq 20000$ $91(15.66)$ $31.51\pm11.43$ $27.61\pm3.46$ Daily screen usage time (h) $0.369$ $0.877$ $< 4$ $102(17.56)$ $30.62\pm10.78$ $27.40\pm3.25$ $-20000$ $91(15.66)$ $31.51\pm11.43$ $27.61\pm3.46$ Daily s	Junior college/college	449(77 28)	31 24+11 95		27 57+3 54	
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$\begin{array}{c cccc} \hline 0.410 & 0.410 & 0.410 & 0.424 \\ \hline 0.413 & 30.75\pm 0.17 & 26.08\pm 3.72 & 0.294 \\ \hline 0.413 & 30.75\pm 0.17 & 26.08\pm 3.72 & 0.294 \\ \hline 0.413 & 30.75\pm 0.17 & 26.08\pm 3.72 & 0.294 $	Occupation $N(\%)$	00(15.77)	52.00-7.055	0.418	27.15-5.50	0 294
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professionals (teachers, engineering technicians, writers, etc.)       127(21.86)       32.74±10.60       27.62±3.49         Clerks or relevant personnel       34(5.85)       31.55±11.29       27.05±2.83         Personnel in commercial business or service       68(11.7)       31.54±11.30       27.85±3.22         Personnel in farming, forestry, animal husbandry, fishery, etc.       /       26.88±2.51       26.88±2.51         Operators of production or transportation equipment, or relevant personnel       3(0.52)       25.33±20.10       28.66±3.21         Housewife       9(1.55)       30.88±8.565       27.55±3.04       27.38±3.55         Monthly income per capita (Yuan)       27(4.65)       33.40±13.26       28.11±4.36         5000       79(13.6)       29.36±11.92       26.54±3.80       0.137         ≤5000       79(13.6)       29.36±11.92       26.54±3.80       500         5000-10000       232(39.93)       30.46±11.81       27.68±3.26       0.137         ≤20000       91(15.66)       31.51±11.43       27.61±3.46       0.877         <4	public institutions	24(4.13)	50.75±10.17		20.08-5.72	
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	service	68(11.7)	31.54±11.30		27.85±3.22	
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Housewife $9(1.55)$ $30.88\pm 8.565$ $27.55\pm 3.04$ Personnel in medical and relevant industry $27(4.65)$ $33.40\pm 13.26$ $28.11\pm 4.36$ Others $271(46.64)$ $29.69\pm 12.53$ $27.38\pm 3.55$ Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ $79(13.6)$ $29.36\pm 11.92$ $26.54\pm 3.80$ $5000-10000$ $232(39.93)$ $30.46\pm 11.81$ $27.68\pm 3.26$ $10000-20000$ $179(30.81)$ $31.97\pm 11.75$ $27.43\pm 3.55$ $\geq 20000$ $91(15.66)$ $31.51\pm 11.43$ $27.61\pm 3.46$ Daily screen usage time (h) $0.369$ $0.877$ $<4$ $102(17.56)$ $30.71\pm 11.73$ $27.50\pm 3.25$ $4-6$ $172(29.6)$ $30.62\pm 10.78$ $27.47\pm 3.65$ $\geq 6$ $307(52.84)$ $31.20\pm 12.30$ $27.40\pm 3.45$	Army personnel	3(0.52)	25.33±20.10		28.66±3.21	
Personnel in medical and relevant industry $27(4.65)$ $33.40\pm13.26$ $28.11\pm4.36$ Others $271(46.64)$ $29.69\pm12.53$ $27.38\pm3.55$ Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ $79(13.6)$ $29.36\pm11.92$ $26.54\pm3.80$ $5000-10000$ $232(39.93)$ $30.46\pm11.81$ $27.68\pm3.26$ $10000-20000$ $179(30.81)$ $31.97\pm11.75$ $27.43\pm3.55$ $\geq 20000$ $91(15.66)$ $31.51\pm11.43$ $27.61\pm3.46$ Daily screen usage time (h) $0.369$ $0.877$ $<4$ $102(17.56)$ $30.71\pm11.73$ $27.50\pm3.25$ $4-6$ $172(29.6)$ $30.62\pm10.78$ $27.47\pm3.65$ $>6$ $307(52.84)$ $31.20\pm12.30$ $27.40\pm3.45$	Housewife	9(1.55)	30.88±8.565		27.55±3.04	
Others $271(46.64)$ $29.69\pm12.53$ $27.38\pm3.55$ Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ $79(13.6)$ $29.36\pm11.92$ $26.54\pm3.80$ $5000-10000$ $232(39.93)$ $30.46\pm11.81$ $27.68\pm3.26$ $10000-20000$ $179(30.81)$ $31.97\pm11.75$ $27.43\pm3.55$ $\geq 20000$ $91(15.66)$ $31.51\pm11.43$ $27.61\pm3.46$ Daily screen usage time (h) $0.369$ $0.877$ $<4$ $102(17.56)$ $30.71\pm11.73$ $27.50\pm3.25$ $4-6$ $172(29.6)$ $30.62\pm10.78$ $27.47\pm3.65$ $>6$ $307(52.84)$ $31.20\pm12.30$ $27.40\pm3.45$	Personnel in medical and relevant industry	27(4.65)	33.40±13.26		28.11±4.36	
Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ 79(13.6) $29.36\pm11.92$ $26.54\pm3.80$ $5000-10000$ $232(39.93)$ $30.46\pm11.81$ $27.68\pm3.26$ $10000-20000$ $179(30.81)$ $31.97\pm11.75$ $27.43\pm3.55$ $\geq 20000$ 91(15.66) $31.51\pm11.43$ $27.61\pm3.46$ Daily screen usage time (h) $0.369$ $0.877$ $<4$ $102(17.56)$ $30.71\pm11.73$ $27.50\pm3.25$ $4-6$ $172(29.6)$ $30.62\pm10.78$ $27.47\pm3.65$ $>6$ $307(52.84)$ $31.20\pm12.30$ $27.40\pm3.45$	Others	271(46.64)	29.69±12.53		27.38±3.55	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Monthly income per capita (Yuan)			0.232		0.137
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	≤5000	79(13.6)	29.36±11.92		26.54±3.80	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	5000-10000	232(39.93)	30.46±11.81		27.68±3.26	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	10000-20000	179(30.81)	31.97±11.75		27.43±3.55	
Daily screen usage time (h) $0.369$ $0.877$ <4	>20000	91(15.66)	31.51±11.43		27.61±3.46	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Daily screen usage time (h)			0.369	2.10	0.877
$4-6$ $172(29.6)$ $30.62\pm10.78$ $27.47\pm3.65$ >6 $307(52.84)$ $31.20\pm12.30$ $27.40\pm3.45$	<4	102(17.56)	30.71±11.73		27.50±3.25	
>6 307(52.84) 31 20±12 30 27 40±3 45	4-6	172(29.6)	30.62±10.78		27.47±3.65	
	>6	307(52.84)	$31.20\pm12.30$		$27.40\pm3.45$	

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Reasons for surgical correction of					
visual acuity (multiple choices)					
Remove the glasses and improve	238(40.96)				
appearance					
Study in higher schools, job	126(21.69)				
selection, or joining the army					
Inconvenience in putting up and off	394(67.81)				
the glasses					
others	14(3.36)				
Surveyed before or after refractive error			<0.001		<0.001
surgery			<0.001		<0.001
Before	164(28.23)	27.37±11.73		26.60±3.26	
After	417(71.77)	32.35±11.47		27.77±3.50	

> Participants' knowledge score (possible range: 0~45) evaluated after surgery was significantly higher than those before surgery (32.35±11.48 vs. 27.38±11.74, P<0.001), indicating an increase of knowledge level after than before surgery. Moreover, participants attitude score (possible range:  $0 \sim 36$ ) evaluated after surgery was significantly higher than those before surgery (27.77±3.505 vs. 26.6±3.267, P<0.001), also indicating an improvement of attitude after than before surgery. According to the knowledge and attitude scores before and after surgery, the participants had insufficient knowledge but positive attitudes toward corrective surgery preoperatively, and sufficient knowledge and continued positive attitudes postoperatively (Table 1 and Figure 1).

Preoperatively, the top three in terms of accuracy rate for the questions under knowledge dimension were K15, K4, and K3, with the accuracy rates of 79.88%, 79.27%, and 78.66%, respectively, whereas K12 (29.27%), K13 (40.24%), and K6 (40.85%) were ranked the last three in the accuracy. Postoperatively, except for K2, K3, K4, and K12 (P > 0.05), the accuracy rates of other questions under knowledge dimension were significantly improved compared with that before operation (P < 0.05). Specifically, the three questions under knowledge dimension with the highest accuracy rates were K15 (88.25%), K4 (83.45%), and K2 (78.90%). And the three questions with the lowest accuracy rates were still K12, K13, and K6, with the accuracy of 37.89%, 57.31%, and 58.99%, respectively (Table S1). Regarding 

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the distribution of attitude dimension, scores found in A1, A4, A5, A6, A8, and A9 after surgery were significantly higher than those before surgery (P < 0.05). For A2, A3, A4, A5, A6, and A8, more participants responded "highly positive" and "positive", while less people responded "negative" and "highly negative" (Table S2). For the knowledge and attitude domains, the two-factor model demonstrated on Figure S1 was tested by validation factor analysis. Satisfactory model fitness was demonstrated (Table S3) and final model demonstrated a strong relationship between items and attitude, as well as knowledge domain, with the composite reliability for all factors except K2, K4, K10 and K12 above the cut-off value of 0.7, as summarized in Table S4. Additionally, in analysis of multivariate linear regression results, the knowledge scores were related to education level (Ref. senior middle school or lower; junior college/college, OR=5.81, 95% CI: 2.52-9.09, P=0.001; postgraduate or higher, OR=7.83, 95% CI: 3.83-11.8, P<0.001) and time of participants being surveyed (Ref. before refractive error surgery; after refractive error surgery, OR=5.09, 95% CI: 3.02-7.16, P<0.001) (Table 2). Different from the knowledge scores, the influencing factors of attitude scores included knowledge scores OR=0.05, 95% CI: 0.03-0.07, P<0.001), sex (Ref. male; female, OR=1.24, 95% CI: -2.8--1.0, P<0.001), age (Ref.  $\leq 20$  years old; 21-30 years old, OR=-1.9, 95% CI: 2.52-9.09, P<0.001; >30 years old, OR=-2.5, 95% CI: -3.5--1.4, P<0.001), registered residence (Ref. agriculture account; non-agriculture account, OR=0.82, 95% CI: 0.22-1.42, P=0.007), monthly income (Ref. ≤RMB 5,000; RMB 5,000-10,000, OR=0.92, 95% CI: 0.06-1.78, P=0.036), and time of participants being surveyed (Ref. before refractive error surgery; after refractive error surgery, OR=0.86, 95% CI: 0.24-1.47, P=0.006) (Table 3). 

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**Table 2** Multivariate linear regression analysis for knowledge

	Univariate analysi	S	Multivariate analysis		
Knowledge	β (95%CI)	p-value	β (95%CI)	p-value	
			$R^2 = 0.0570*$		
			F= 12.68 (P<0.0	01)	

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Sex				
Male	Ref	-	Ref	-
Female	1.73(-0.36,3.83)	0.106		
Age (years)				
≤20	Ref	-	Ref	-
21-30	0.03(-2.58,2.66)	0.978		
>30	-2.64(-5.84,0.54)	0.104		
Registered residence				
Agriculture account	Ref	-	Ref	-
Non-agriculture account	0.92(-1.0,2.85)	0.351		
Education level				
Senior middle school or lower	Ref	-	Ref	-
Junior college/college	5.80(2.45,9.14)	0.001	5.81(2.52,9.09)	0.00
Postgraduate or higher	7.42(3.34,11.4)	< 0.001	7.83(3.83,11.8)	<0.0
Occupation, N (%)				
Government administrators of the				
country or leaders of enterprises and	Ref	-	Ref	-
public institutions				
Professionals (teachers,	1 00( 2 14 7 12)	0.445		
engineering technicians, writers, etc.)	1.99(-3.14,7.13)	0.445		
Clerks or relevant personnel	0.80(-5.34,6.96)	0.796		
Personnel in commercial business		0.77(		
or service	0.79(-4.68,6.27)	0.776		
Personnel in farming, forestry,	0 41( ( 70 7 (1)	0.01		
animal husbandry, fishery, etc.	0.41(-6./8,/.61)	0.91		
Operators of production or	6.			
transportation equipment, or relevant	-			
personnel				
Army personnel	-5.41(-19.5,8.72)	0.452		
Housewife	0.13(-8.88,9.16)	0.976		
Personnel in medical and relevant	2 (5( 2 01 0 12)	0 421		
industry	2.03(-3.81,9.13)	0.421		
Others	-1.05(-5.96,3.86)	0.674		
Monthly income per capita (Yuan)				
≤5000	Ref	-	Ref	-
5000-10000	1.09(-1.90,4.10)	0.473		
10000-20000	2.61(-0.50,5.72)	0.101		
≥20000	2.14(-1.40.5.69)	0.235		
Daily screen usage time (h)		-		
<4	Ref	-	Ref	_
4-6	-0.09(-2.98.2.79)	0.949		
>6	0.48(-2.15.3.13)	0.716		
Surveyed before or after refractive		0.,10		
error surgerv				
			D C	
Before	Ref	-	Ref	-

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A	Univariate analysis	6	Multivariate analysis		
Attitude	β (95%CI)	p-value	β (95%CI)	p-value	
		-	$R^2 = 0.1334^*$	-	
			F= 5.70 (P<0.001	)	
Knowledge	0.07(0.05,0.09)	< 0.001	0.05(0.03,0.07)	< 0.001	
Sex					
Male	Ref	-	Ref	-	
Female	0.93(0.31,1.55)	0.003	1.24(0.59,1.89)	< 0.001	
Age (years)					
≤20	Ref	-	Ref	-	
21-30	-1.33(-2.11,-0.56)	0.001	-1.9(-2.8,-1.0)	< 0.001	
>30	-1.53(-2.47,-0.59)	0.001	-2.5(-3.5,-1.4)	< 0.001	
Registered residence					
Agriculture account	Ref	-	Ref	-	
Non-agriculture account	0.96(0.39,1.53)	0.001	0.82(0.22,1.42)	0.007	
Education level					
Senior middle school or lower	Ref	-	Ref	-	
Junior college/college	1.20(0.20,2.20)	0.018	0.99(-0.04,2.03)	0.061	
Postgraduate or higher	1.07(-0.14,2.28)	0.083	0.73(-0.57,2.05)	0.268	
Occupation, N (%)					
Government administrators of					
the country or leaders of	Ref	-	Ref	-	
enterprises and public institutions	L	7			
Professionals (teachers,					
engineering technicians, writers,	1.53(0.01,3.05)	0.047	1.21(-0.22,2.65)	0.098	
etc.)		U,			
Clerks or relevant personnel	0.97(-0.84,2.79)	0.293	0.52(-1.20,2.24)	0.553	
Personnel in commercial	1 76(0 14 3 30)	0.033	1 45( 0 07 2 00)	0.063	
business or service	1.70(0.14,5.59)	0.033	1.43(-0.07,2.99)	0.005	
Personnel in farming, forestry,					
animal husbandry, fishery, etc.					
Operators of production or					
transportation equipment, or	0.80(-1.32,2.93)	0.458	1.70(-0.37,3.77)	0.108	
relevant personnel					
Army personnel	2.58(-1.60,6.76)	0.226	2.41(-1.51,6.35)	0.228	
Housewife	1.47(-1.19,4.14)	0.279	1.14(-1.40,3.68)	0.379	
Personnel in medical and	2.02(0.11.3 94)	0.038	1.53(-0.28 3 35)	0.097	
relevant industry		0.000		0.07	
Others	1.29(-0.15,2.75)	0.081	0.82(-0.58,2.22)	0.25	
Monthly income per capita (Yuan)					
≤5000	Ref	-	Ref	-	
5000-10000	1.14(0.25,2.03)	0.011	0.92(0.06,1.78)	0.036	

10000-20000	0.89(-0.02,1.81)	0.057	0.52(-0.40,1.44)	0.269
≥20000	1.07(0.02,2.11)	0.045	0.82(-0.22,1.86)	0.122
Daily screen usage time (h)				
<4	Ref	-	Ref	-
4-6	-0.0(-0.8,0.82)	0.939		
>6	-0.1(-0.8,0.67)	0.79		
Surveyed before or after refractive				
error surgery				
Before	Ref	-	Ref	-
After	1.17(0.54,1.79)	< 0.001	0.86(0.24,1.47)	0.006

\*Adj R-squared

> Before surgery, lower knowledge scores were more likely to be found in those who were male (P=0.001), aged more than 30 years old (P=0.018), and had senior middle school or lower education level (P=0.014). Unlike this result, only the participants with senior middle school or lower education level had lower knowledge scores after surgery (P=0.017). Regarding attitude scores, the participants scored lower were male (P=0.006) before surgery. After surgery, attitude scores differed by age (P=0.002) and registered residence (P=0.001) (**Table 4**).

Table 4 Knowledge and attitude scores surveyed before and after surgery according to
different baseline characteristics.

	Knowledge s	core			Attitude score				
	Before		After		Before		After		
Variables	surgery	p-valu	surgery	p-valu	surgery	p-valu	surgery	p-valu	
	Mean + SD	e	Mean + SD	e	Mean ±	e	Mean ±	e	
	Weatt ± SD		Wiedii ± 5D		SD 🔷		SD		
Total score	27.38±11.7		32.35±11.4		26.6±3.26		27.77±		
	4		8		7		3.505	p-valu e 0.052 0.002	
C	0.001		0.010		<			0.052	
Sex		0.001		0.010		0.001		0.052	
Mala	21.7 + 11.14		31.94±12.0		24.95±3.4		27.29±		
Iviale	21./±11.14		9		07		3.687		
Fomalo	29.03±11.4		32.54±11.1		27.09±3.0		28.00±		
Feinale	3		9		73		3.398		
Age (years)		0.018		0.266		0.986		0.002	
<20	25 6+12 00		32.50±11.9		26.67±3.7		28.95±		
<u></u>	23.0±15.09		52		92		3.006		
21.30	28.65±11.0		32.93±11.6		26.61±3.3		27.59±		
21-30	5		00		22		3.364		
>30	21.23±13.0		30.63±10.6		26.50±2.6		27.20±		

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Desistand	4		26		50		4.059	
residence		0.175		0.705		0.183		0.0
Agriculture	25.88±12.3		32.11±11.8		26.19±3.4		27.15±	
account	6		04		48		3.672	
Non-agricu	28 41+11 2		32 54+11 2		26 89+3 1		28 25+	
lture account	36		46		22		3.303	
Educationlev		0.014		0.017		0.474		0.1
el		0.014		0.017		0.474		0.1
Senior								
middle	20.14±10.5		27.39±11.1		25.64±3.3		26.63±	
school or	67		71		19		2.604	
lower								
Junior	27 32+11 9		32 71+11 6		26 64+3 2		27 92+	
college/colleg	48		39		48		3.596	
e D i l								
Postgradua	31.25±9.76		33.73±9.85		$26.93\pm3.3$		27.71±	
te or nigher	0		4		55		5.39/	
income		0.221		0.504		0.170		0.1
appita (Vuon)		0.321		0.504		0.179		0.1.
<5000	23 35+11 1		31 02+11 6		25 17+2 2		26.84+	
≥3000	$25.55\pm11.1$ 97		$72^{51.02\pm11.0}$		25.4715.5		20.041	
5000-1000	26 50+11 4		31 04+11 6		26 88+3 1		28.00+	
0	94		29		$20.00 \pm 3.1$		3270	
10000-200	28 80+12 2		33 54+11 2		26 27+3 3		28 01+3 5	
00	81		10		36		37	
>20000	28 83+11 2		32 48+11 4	D	27 50+3 2		27.66+	
	12		43		17		3.570	
Daily screen								
usage time		0.645		0.827		0.717		0.9
(h)								
<4	25.23±10.9		32.23±11.5		26.18±2.5		27.88±	
	59		48		00		3.354	
4-6	27.47±11.4		31.88±10.2		26.86±3.5		27.72±	
	58		81		36		3.687	
>6	27.84±12.1		32.67±12.1		26.57±3.2		27.77±	
	17		26		98		3.468	
Reasons for								
surgical								
correction of								
visual acuity								
the classes	20 60 111 5		22.56		27.5212.0		27.07	
and improve	29.00±11.5	0.085#	$33.30\pm$ 10.251	0.056	21.33±2.9	0.010#	21.9/±   3.302	0.3
annearance	J <del>-1</del>		10.231		50		5.505	
Study in								
higher								
schools iob	20 20+11 7	0.075"	30 93+		25 00+3 8		27 81+	
selection. or	37	0.003#	12.667	0.142	66	0.019#	3.636	0.9
joining the							2.000	
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army		1	1					
army Inconvenie								
army Inconvenie nce in putting	27.50±11.7	0.927#	33.58±10.4	0.004	26.42±3.0	0.271#	27.89±	
army Inconvenie nce in putting up and off the	27.50±11.7 37	0.837#	33.58±10.4 58	0.004	26.42±3.0 93	0.271#	27.89± 3.312	0.33

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Г						1			1
	others			24.07±	0.006			26.43±	0.144#
		-	-	13.697	0.006	-	-	5.515	0.144"

<sup>#</sup>Comparison of participants' score between those who chose the option and did not.

#### Discussion

This study suggested that myope or their guardians had positive attitudes toward corrective surgery both preoperatively and postoperatively. However, they might have insufficient knowledge toward refractive surgery, which might be improved after the surgery. These findings may provide inspiration and direction for ophthalmic education before and after refractive surgery. 

In the present study, the majority of participants were females aged less than 30, which was consistent with the epidemiology of myopia reported in previous studies(20-22). In addition, those with higher educational level and longer daily screen usage time were vulnerable to myopia and would like to correct it via refractive surgery. In line with these results, Mirshahi et al. (23) presented that people with higher educational achievements have higher prevalence of myopia than individuals with lower level of education. In addition, several studies demonstrated that frequent exposure to digital smart device screen could be a risk factor for myopia (24-26). The findings of this study showed that the primary motive for myopia correction surgery was the inconvenience of putting on and taking off glasses, followed by the aim to improve appearance. However, Khan-Lim et al. (27) found that the main motive for seeking refractive surgery was to meliorate unaided social vision. Xu et al. (28) evinced that career requirements were the most crucial reason for seeking refractive surgery and removing glasses to improve facial appearance was a main reason for female respondents. 

A study among female students in Saudi university showed that the respondents had a high level of knowledge and awareness of refractive correction methods, especially refractive surgery (9). Contrary to this result, the knowledge score and accuracy rates for questions 

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under knowledge dimension in our study were unsatisfactory before surgery. This difference may be due to the fact that the participants of the previous study were university students and/or even medical students, who had a high capacity for knowledge learning and a certain degree of knowledge about myopia. After surgery, the knowledge scores of the participants were significantly improved, which may be attributed to the preoperative conversation with the surgeon explaining the knowledge of refractive surgery. Interesting to note, that our findings showed a good fit for the questionnaire, supporting the construct validity, but lower composite reliability for K2, K4, K10 and K12 – while 3 of those items also did not demonstrate improvement after operation, suggesting that some of the answers might be influenced by the questionnaire design. However, all other items in knowledge and attitude domains had reasonably good reliability, and all findings support the significant improvement of overall knowledge scores. Additionally, the results of multivariate linear regression analysis indicated that the knowledge score was associated with educational level before and after operation. Indeed, a number of reports consistently supported the point that those with higher education levels commonly had better health knowledge (29-31). Meanwhile, knowledge scores differed by gender and age preoperatively, but not postoperatively. This result may be due to the counseling of men and age >30 years about knowledge related to myopia and corrective surgery, and serves as a reminder to focus on this population during knowledge dissemination. Notably, the three questions under knowledge dimension with the lowest accuracy rates before and after surgery were K12, K13, and K6, which were related to indications and complications of refractive surgery. This might be linked to the fact suggested by previous cross-sectional study that patients were prone to refusing refractive surgery because of the fear of the surgical complications (10). Consequently, targeted education on the indications and complications of refractive surgery should be implemented. 

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In addition, this study found that the participants had continued positive attitudes toward refractive surgery both preoperatively and postoperatively. Similarly, the majority of individuals reported a high level of satisfaction and positive attitude about vision correction surgery (32). The attitude score of females before operation was higher than that of males while the attitude score of both after operation was similar, indicating an attitude change in males. This may be because males are less willing to improve their appearance through refractive surgery, and more likely to recognize the efficacy of surgery and change their attitudes. However, participants had similar preoperative attitude scores for different age and registered residence, yet differed in age and registered residence postoperatively. Specifically, lower attitude scores were more likely to be observed in the participants who aged >30 years and had agriculture account. This may be attributed to the efficacy of refractive surgery for myopia associated with younger age and low myopia (33). Patients with agriculture account are usually older and have higher myopia, thus the outcome of refractive surgery may be impaired. It is also worth noting that attitude scores are influenced by knowledge scores, suggesting that enhancing education about myopia and refractive surgery contributes to the development of positive attitudes. Moreover, most participants believed that refractive surgery was effective and had more advantages than disadvantages. In agreement with these findings, previous studies demonstrated that the various refractive surgeries achieved favorable visual outcomes in the correction of myopia (34-36). 

There are some limitations in the present study. First, the setting of the trial was in eastern province with relatively developed economy and society, limiting the wider generalizability of the results of our study. Second, due to using a self-designed questionnaire, bias and overestimation of real results may be introduced by responder and some variables related to knowledge and attitude scores may be neglected. However, additional validation factor analysis was conducted to assess the factorial structure of the questionnaire and results Page 19 of 40

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demonstrated good validity and reliability for the most of the questions. Finally, as a result of cross-sectional design characteristics, the relationship between knowledge and attitude toward different variables was not specifically determined.

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## 290 Conclusion

To summarize, myope or their guardians showed positive attitudes towards corrective surgery both before and after surgery. They might have insufficient knowledge towards refractive surgery preoperatively, which might be improved after the surgery. Education for patients and their guardians by ophthalmologists on the knowledge of refractive surgery should be strengthened, especially preoperative. Addressing some of the beliefs and concerns of myopia patients or their guardians may encourage patients to seek the medical help.

- 297 298
  - 298 List of abbreviations
  - 299 Knowledge, attitudes, and practices KAP
  - 300 Standard deviation SD
- 301
- 302 **Declarations**

# 303 Ethics approval and consent to participate

All procedures were performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This study was approved by the Ethics Committee of The First Affiliated Hospital of Soochow University [No.321 (2023)]. Informed consents were obtained from all the participants. All methods were carried out in accordance with relevant guidelines and regulations.

- 309 **Consent for publication** 
  - 310 Not applicable

2		
3 4	311	Availability of data and materials
5 6 7	312	All data generated or analysed during this study are included in this published article [and its
7 8 9	313	supplementary information files].
10 11	314	Competing interests
12 13	315	The authors declare that they have no known competing financial interests or personal
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26 27	321	Authors' contributions
28 29	322	(I) Conception and design: YF Q
30 31 32	323	(II) Administrative support: YF Q
33 34	324	(III) Provision of study materials or patients: YF Q
35 36	325	(IV) Collection and assembly of data: All authors
37 38	326	(V) Data analysis and interpretation: All authors
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Figure 1 Comparison of knowledge (A), attitude (B) scores between evaluated before and

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**Figure Legends** 

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# **Supplementary material**



**Figure S1** Two-factor model demonstrating the relationship between items and their respective factors according to the validation factor analysis

Page 29 of 40 1			BMJ Open	d by copyright	bmjopen-2024	
2 3 4 5 6	Supplementary Tables			, including fo	-092125 on 27	
7 8 9	Table S1 Knowledge dimension	Before surg	erv	After surge	March 2	
10 11 12	Knowledge	Accuracy ra	ate, N (%)	Accuracy rate	nemeafs	— p-value
13 14 15	K1	93	56.71	315 and c	nlog 10 10 10 10 10 10 10 10 10 10 10 10 10	<0.001
16 17 18	K2	120	73.17	329 min	r (ABES	0.138
19 20 21	K3	129	78.66	327 <b>A</b>	28.42	0.949
22 23	K4	130	79.27	348 training	<b>b</b> 88.45	0.234
24 25 26	K5	85	51.83	277 and si.	<b>0</b> .43	0.001
27 28 29	K6	67	40.85	246 milar te	<b>9</b> 578.99	<0.001
30 31	K7	83	50.61	282	67.63	<0.001
32 33 34	K8	107	65.24	314 <b>B</b>	145.30 Ag	0.015
35 36 37	К9	96	58.54	303	ерд.66 В:	0.001
38 39 40 41 42	K10	86	52.44	278	b <b>6</b> .67 Øgraphique	0.001
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 <u>2</u>					024-09 ight, in		
3 1 5	K11	94	57.32	276	cluding	0.045	
5 7	K12	48	29.27	158	for use	0.055	
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1  2	K14	108	65.85	310	ed to te te	0.040	
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3 4	Table S2 Att	itude dimensi	on						2125 c cludin			
5 _ 6 7		Highly	positive (4	Desitive	(2	Northal		Negat	g for use	Highly	negative (0	
8 9 10		points)		Positive	(3 points)	neutra	i (2 points)	negat	1Ve (1 <b>%)</b> eigne relation	point)		p-val
11 12 13	Attitude	%	(before/after	%	(before/after	%	(before/after	%	(before after	%	(before/after	ue
14 15		surgery)		surgery	)	surgery	7)	surge	ry) d	surger	y)	
16 <sup>-</sup> 17 18	A1	0.61	2.88	14.63	36.21	65.24	53.96	16.46	data migen 5.040	3.05	1.92	< 0.00
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22 23	A2	40.85	52.76	53.05	42.45	6.10	4.32	0.00	0.24 ing	0.00	0.24	0.056
24 25 26	A3	45.73	55.88	50.61	40.05	3.05	3.84	0.61		0.00	0.00	0.079
27 28 29	A4	35.37	49.88	53.66	44.60	9.76	5.04	1.22	0.24 tecl	0.00	0.24	0.003
30 31 32 33	A5	32.93	55.88	60.37	41.49	6.71	2.40	0.00	0.2025 at	0.00	0.00	<0.00 1
34 35 36	A6	32.93	48.92	55.49	44.12	11.59	6.24	0.00	Agence B	0.00	0.00	0.001
37 38 39 40 41 42	A7	2.44	3.12	16.46	11.51	40.85	37.89	31.71	35.01 ibliographique d	8.54	12.47	0.336

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**Table S3** A good model fit for the construct, indicated by: standardized root mean residual (SRMR); root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker Lewis Index (TLI).

Indicators	Reference	Results
RMSEA	<0.08 Good	0.061
SRMR	<0.08 Good	0.068
TLI	>0.8 Good	0.872
CFI	>0.8 Good	0.884

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		Estimate	P >  z
K1	Knowledge	1	
K2	Knowledge	0.40	<0.001
К3	Knowledge	0.75	<0.001
K4	Knowledge	0.63	<0.001
К5	Knowledge	1.08	<0.001
K6	Knowledge	1.23	<0.001
K7	Knowledge	0.91	<0.001
K8	Knowledge	1.08	<0.001
К9	Knowledge	1.00	<0.001
K10	Knowledge	0.69	<0.001
K11	Knowledge	1.19	<0.001
K12	Knowledge	0.51	<0.001
K13	Knowledge	1.25	<0.001
K14	Knowledge	1.11	<0.001
K15	Knowledge	0.73	<0.001
A1	Attitude	1	
A2	Attitude	2.37	<0.001
A3	Attitude	2.38	<0.001
A4	Attitude	2.72	<0.001
A5	Attitude	2.35	<0.001

# Table S4 Results of validation factor analysis
A	.6	Attitude	2.30	< 0.001
А	.7	Attitude	-0.93	< 0.001
А	.8	Attitude	0.99	< 0.001
А	.9	Attitude	1.75	< 0.001

A9	Attitude	1.75
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We are investigators from the Ophthalmology Department of First Affiliated Hospital of Soocl	hows rel	The intersity, and this questionnaire was	
designed by us to investigate the awareness of individuals underwent refractive surgery in out hospital	aner to	Beguardians on surgeries for refractive	
errors (myopia). The data collected by this questionnaire are confidential, and your information will n	ot and	desclosed, so please don't worry about	
it. The data provided by you will only be used for the survey, which could help providing evidence	foata n	exeloping the scientific interventional	
strategies. To guarantee the validity of this survey, please answer the questions according to your	owing,	anditions. Thank you very much for	
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		b. Female <b>ថ</b>
	2. Your age (years):	a. <20 5 ma
		b. 21-30
		b. 31-40
		c. 41-50
		d. >50 to
	3. Who is receiving the refractive surgery:	a. Myself
		b. My child
	4. Registered residence:	a. Agriculture
		b. Non-agriculture
	5. Educational level:	a. Junior middle school or low
		/ Cb. Senior middle school/ techni 🛃 💆 condary school
		c. Junior college/college
		d. Postgraduate or higher
	6. Occupation:	a. Government administrators of the country or leaders of enterprises
		and public institutions
		b. Professionals (teachers, engineering technicians, and writers, etc.)
		c. Clerks or relevant personnel 👼 🛓
		d. Personnel in commercial bus ness or service
		e. Personnel in farming, forestre, are mal husbandry, or fishery, etc.
		f. Operators of production or grantsportation equipment, or relevant
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7. The monthly income of your family per capita in the past year (including physical income and rental income): Yuan.	a.<2000 b.2000-5000 c.5000-10000 d.10000-20000 gt 125 on 27 d.1000-20000 gt 221 c.500-10000 gt 221 c.5000-10000 gt 221 c.5000-10000 gt 221 c.5000-20000 gt 221 c.5000-20000 gt 221 c.5000 gt 221 c.5000 c.5000 gt 221 c.5000 c.5000 gt 221 c.5000 c.50
8. The degree of myopia before surgery (Please report the degree of you	e.>20000 وَحَقَقَ مَعَ مَعَ مَعَ مَعَ مَعَ مَعَ مَعَ
9. Daily time of screen usage, including the use of cellphone, iPad, computer, or television, etc. (Please report the time of your child if you are a parent):	a. $<2 h$ d ment S.b. 2-4 hto the superiorc. 4-6 hand dd. $>6h$ d d
10. Which are the reasons that you want to correct the visual acuity by refractive surgery?	a. Remove the glasses and improve the appearance b. Study in higher schools, job section, or joining the army c. Inconvenience in putting up and off the glasses
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3	The Second Part: Knowledge on refractive (myopia) surgery 흔 있
4 5	K1. Refractive surgeries mainly include two types, i.e. corneal refractive surgery and implantable contage legs (ICL).
6	a. Right b. Wrong c. Unclear
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9	K2. All myopia patients aged >18 years wanting to remove the glasses can receive refractive surgery.
10 11	a. Right b. Wrong c. Unclear
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13 14	K3. Laser surgery for myopia is a "subtraction surgery", while ICL is an "addition surgery".
15	a. Right b. Wrong c. Unclear
16	K4. Patients need to stop wearing contact lenses before surgery. Generally, wearing of soft lenses (regular contact lenses) should be stopped
18	for 1 week, hard lenses such as RGP should be stopped for 1 month, and orthokeratology lenses should be stopped for more than 3 months.
20	a. Right b. Wrong c. Unclear <u>G. 2</u>
21	hyperonia less than 600 degree
22 23	a. Right b. Wrong c. Unclear
24	K6. For excimer laser surgery, the cornea need to by >450 nm, and the anticipated thickness of residual corneal flap after the surgery is >250
25	um (>280 um is recommended), and should be >50% of the thickness before surgery.
27	a. Right b. Wrong c. Unclear
28	K7. For patients with relatively thin cornea, high degree of myopia, with no other contraindications, and meet the requirements of surgical
30 31	a Right b Wrong c Unclear
32	K8 Full femtosecond laser surgery is not suitable for patients with astigmatism $>50$ degrees and correct thickness below the required
33	parameters, or myopia >1000 degrees.
35	a. Right b. Wrong c. Unclear
36 27	K9. Full femtosecond laser surgery is suitable for myope of 100-1000 degrees and astigmatism <500 degrees
38	a. Right b. Wrong c. Unclear
39 40	K10. Full femtosecond laser surgery is suitable for patients loving strenuous exercises, fighting and boxing, and competitive sports, or specific
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K11. ICL surgery has the characterist	c of reversible and is suitable for correcting myopia with c	r wi <b>ğ</b> ho	o <b>u</b> asti	gmatism. ICL surgery is the	
preferred method for correcting high-g	rade myopia >1000 degrees. Patients with moderate- or low-	legr	mayopia	a that meeting the indications	
could select the method according to th	eir own conditions.	s rela	ch 2		
a. Right b. Wrong c. Unclear		ated	025 5 1		
K12. The follows are complications of	risks after refractive surgery: 1) xerophthalmia; 2) corneal su	beputh	$\mathbf{\hat{e}}$ Hal ha	(ze; 3) infection; 4) refractive	
vision and difficult in driving in the ni	s) annount in reading; o) residual diopters after surgery; /) ( ght. How many of them do you know?	iry eave	asso)da aso)da	azzing; and 9) reduced night	
vision, and difficult in driving in the in	git. How many of them do you know?	and	ade		
a. $\geq 7$ ; b.5-7; c.1-4; d. none a	t all	data	d fro		
K13. For superficial excimer laser surg	ery (such as LASEK or TPRK, etc.), the degree of correction	sho	the no	higher than 800 degrees. The	
surgery is more suitable for several sp	ecific conditions, such as patients with corneal scars and o	pacize	s, or ep	bithelial basement membrane	
dystrophy. However, the discomfort in	the eyes after surgery is substantial, the recovery cycle is re	ativay	<sup>y</sup> <mark>B</mark> ng, a	and the patients have the risk	
of corneal stroma opacity.		train	jope		
a. Right b. Wrong c. Unclear		ing,	n.b		
K14. The range of diopters that can be	corrected by semi-femtosecond laser surgery is large, during	the	rogess f	femtosecond laser is required	
to make the flaps, and the postoperativ	e risk of corneal complications is higher than other correction		o <mark>ta</mark> s. Imj	pact by accident or trauma of	
the eyes after surgery could potentially	damage the cornea, and emergent treatment is needed for se	vere <b>£</b> a	ි <b>ලු</b> S.		
a. Right b. Wrong c. Unclear	v involves minimally investive injury (the smallest is 2 cm)	te c the term		Coursery is fast the effective	
cansulorheyis area is large and the cor	nea is safe and stable after surgery		N N	surgery is last, the effective	
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3	The Third Part Attitude on refractive (myonia) surgery 9
4	A1 Your awareness on refractive surgery
5	a Highly unaware: b Unaware: c Fair: d Aware: e Highly aware
7	A? Are you satisfied to the preoperative examination processes?
8	a Highly satisfied b Satisfied c Fair d Unsatisfied e Highly unsatisfied
9 10	A3 Are you satisfied to the explanations by the personnel from the hospital?
11	a. Highly satisfied: b. Satisfied: c. Fair: d. Unsatisfied: e. Highly unsatisfied
12	A4. Do you agree that you have fully understood the detailed processes of this surgery before the surger
13	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
15	A5. Do you agree that you think you have selected the most suitable surgical type?
16 17	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
18	A6. Do you agree that in your case, the advantages of the myopia correction surgery overwhelm the disadvantages?
19	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
20 21	A7. Do you agree that advertisements could influence you in understanding the myopia correction surge
22	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
23	A8. How do you think the effects of the myopia surgery?
24 25	a. Highly effective, and the visual acuity recovered to normal level; b. Effective but not very substantia; 🛃. Effective but with substantial side
26	effects; d. Effective, but refractive regression occurred; e. Not effective at all
27	A9. Will you recommend the myopia correction surgery to your friends with myopia?
28 20	a. Strongly recommend; b. Recommend; c. Fair; d. Not recommend; e. Highly not recommend 👼 🛓
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# Knowledge and attitude of myope or their guardians toward refractive surgery: a cross-sectional survey

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Knowledge and attitude of myope or their guardians toward refractive surgery: a cross-sectional survey

Running title: KA on refractive surgery.

### Liqian Mu<sup>1</sup>, Yifeng Qian<sup>2\*</sup>

<sup>1</sup>Department of General Surgery, the First Affiliated Hospital of Soochow University, Suzhou, China.

<sup>2</sup>Department of Ophthalmology, the First Affiliated Hospital of Soochow University, Suzhou,

China.

#### \*Corresponding author

Yifeng Qian

Department of Ophthalmology, the First Affiliated Hospital of Soochow University, Suzhou,

China.

Email: qianyifeng@suda.edu.cn

#### Abstract

**Background:** Refractive surgery is gaining widespread popularity; however, there remains a limited understanding of the knowledge and attitudes of myopes regarding these procedures.

**Objectives:** To investigate the knowledge and attitudes of myopes or their guardians toward refractive surgery.

**Design:** Cross-sectional study.

**Participants:** 581 myopes or their guardians in Suzhou City, Jiangsu Province, China, surveyed between August and October 2022.

**Outcome Measures:** Knowledge and attitude scores before and after refractive surgery, ranging from 0 to 45 and 0 to 36, respectively.

**Results:** Post-surgery knowledge ( $32.35 \pm 11.48$  vs.  $27.38 \pm 11.74$ , P < 0.001) and attitude ( $27.77 \pm 3.505$  vs.  $26.6 \pm 3.267$ , P < 0.001) scores were significantly higher than pre-surgery scores. Participants showed insufficient knowledge but positive attitudes preoperatively, with significant improvements postoperatively. Factors influencing knowledge scores included education level (Ref. senior middle school or lower; junior college/college, OR=5.81, 95% CI: 2.52-9.09, P=0.001; postgraduate or higher, OR=7.83, 95% CI: 3.83-11.8, P<0.001) and survey timing (after refractive error surgery, OR=5.09, 95% CI: 3.02-7.16, P<0.001), while attitude scores were influenced by knowledge scores (OR=0.05, 95% CI: 0.03-0.07, P<0.001), gender (female, OR=1.24, 95% CI: -2.8--1.0, P<0.001), age (21-30 years old, OR=-1.9, 95% CI: 2.52-9.09, P<0.001; >30 years old, OR=-2.5, 95% CI: -3.5--1.4, P<0.001), and survey timing (after refractive error surgery, OR=0.86, 95% CI: 0.24-1.47, P=0.006).

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**Conclusions:** Myopes or their guardians had positive attitudes toward refractive surgery both pre- and postoperatively. Insufficient knowledge prior to refractive surgery underscores the critical need for informed decision-making before undergoing the procedure.

Keywords: knowledge, attitude, refractive surgery, myopia, cross-sectional study

#### Strengths and limitations of this study

- Comparatively big sample size (581 participants) ensures robust statistical power and generalizability of findings.

- Comprehensive assessment of both knowledge and attitudes provides a holistic view of patient perspectives on refractive surgery.

- Study setting in a relatively developed eastern province in China which might limit generalizability to other regions with different economic and social conditions.

- Use of a self-designed questionnaire may introduce bias and overestimate results,

potentially overlooking important variables related to knowledge and attitude.

#### Background

Refractive error (RE) is one of the most common ophthalmologic disorders among children and adolescents worldwide, and include myopia, hyperopia, and astigmatism[1]. It is reported that nearly 2.3 billion people worldwide live with refractive error, and this number is rising as the prevalence of myopia increases[2]. It is well-known that a high rate of myopia occurs in East and Southeast Asian schoolchildren and young adults, with 67.3% of grade 7 children and 83.2% of university students affected in central China[3]. High or pathologic myopia represents a significant concern as it can lead to irreversible visual impairment and, in severe cases, blindness, imposing substantial physical, emotional, and economic burdens on individuals, families, and society [4].

At present, the main methods of myopia correction include spectacles, contact lenses, and refractive surgery [5]. Recent studies discuss many disadvantages of spectacles, reported by myopes, such as inconvenience, limited vision, and low resolution, while the use of contact lenses may increase the risk of suffering from conjunctivitis, keratitis, and other eye diseases[6, 7]. Compared with spectacles and contact lenses, refractive surgery was shown to correct the refractive error permanently [8]. However, in the face of emerging popularity, there are many expectations and concerns regarding the procedure and its outcome. In particular, a number of patients may refuse refractive surgery due to the lack of information about correction methods and fear of complications [9, 10]. Another study in 2021 demonstrated that although refractive surgery is a common surgical procedure, patients undergoing it have a limited knowledge with the Internet as the main source of information [11]. According to knowledge, attitudes, and practices (KAP) theory, knowledge is the basis for behavior change, and beliefs and attitudes are the driving force for behavior change [12-14]. Therefore, it is helpful to find out and improve the knowledge and attitude of

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patients toward refractive surgery, which may contribute to easing their worries associated with the surgery and facilitate informed decision-making.

A majority of previous studies are focused on exploring the efficacy of different control or treatment methods for myopia[15-17], but, to the best of our knowledge, there is no study evaluating both preoperative and postoperative knowledge and attitude of Chinese patients towards refractive surgery. Accordingly, the purpose of this study was to investigate the knowledge and attitude of the patients or their guardians both before and after refractive surgery.

#### Methods

#### Patient and public involvement

In the design, implementation, and dissemination of this study, we actively involved patients and the public. Initially, during the design phase, we conducted focus group discussions with individuals who had undergone refractive surgery and their guardians to understand their knowledge levels, attitudes, and informational needs regarding refractive surgery. This ensured that our survey content was both comprehensive and relevant to real-world experiences. To enhance the acceptability and response rate of the survey, we incorporated feedback from potential participants, simplifying language and optimizing question structure. Post-surgery, we also invited a subset of participants to review preliminary findings, ensuring our results accurately reflected their experiences and perspectives. For effective dissemination of our research findings, we plan to share the conclusions through various platforms such as social media, community health talks, and local healthcare networks. The aim is to increase public awareness about refractive surgery and encourage informed decision-making among potential patients. By involving patients and the public throughout the research process, we not only enhanced the relevance and practicality of our study but Page 7 of 40

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also fostered better communication and trust between healthcare providers and patients. These efforts underscore the importance of engaging end-users in medical research to improve outcomes and satisfaction.

#### Study design and participants

This cross-sectional study included myope or their guardians between August and October of 2022 in Suzhou city, Jiangsu Province, China. The participants of this study were randomly selected from ophthalmology department at the author's Hospital. The inclusion criteria were as follows: 1) those who plan refractive surgery in the next 6 months or had undergone refractive surgery (if the myope less than 18 years old, his/her guardian will participate in this survey instead); 2) those who can understand and complete questionnaires; 3) those who volunteer to participate. This study was approved by the Ethics Committee of the author's Hospital. Informed consents were obtained from all participants.

#### Procedures

Convenience sampling was adopted to select the participants from the Ophthalmology department of the author's Hospital, and then a self-designed questionnaire was used for the investigation. The questionnaire was designed based on the *Ophthalmology (the 9<sup>th</sup> version in 2018)* [18] and *Ophthalmic Surgery (the 4<sup>th</sup> version in 2014)* [19], and modified according to the suggestions of two experts. A pilot survey was performed in a small scale (with 50 questionnaires dispatched), and the validity and reliability were assessed. The Cronbach's alpha ( $\alpha$ ) of the questionnaire was 0.8547, indicating that the internal consistency of the questionnaire was satisfactory [20].

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The final questionnaire (**Appendix**) contained 34 items distributed in 3 dimensions. The dimension for baseline information included 10 items. The knowledge dimension included 15 items, with each correct answer corresponding to 3 point, and 0 point for wrong or unclear answer, and the total score for knowledge was 0-45 points; The attitude dimension included 9

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items, and the 5-level Likert scale was used for scoring. The selection of "Highly unaware, or highly agree" for items 1 and 7 was assigned 0 point, the selection of "Unaware, or agree" was assigned 1 point, the selection of "fair, or don't care" was assigned 2 points, the selection of "aware, or disagree" was assigned 3 points, and "Highly aware" or "Highly disagree" was assigned 4 points. For items 2, 3, 4, 5, 6, 8, 9, the scores were assigned in reverse to the scores for items 1 and 7. The maximal total score for attitude was 0-36 points. Based on the cut-off adopted by previous KAP studies [9, 21], knowledge score less than 70% of the maximal score was considered "insufficient knowledge", and more than 70% was "sufficient knowledge". For the attitude score, less than 50% of the total score was considered "negative attitude", 50-70% was "moderate attitude", and more than 70% was "positive attitude".

The on-line questionnaire was established by the SoJump APP software on WeChat, and a QR code was generated to allow the data collection through WeChat. The participants scanned the QR code and filled out the questionnaire. To ensure the quality and completeness of the questionnaire survey, each IP was allowed to submit the answer only once, and all items were mandatory for participants. The completeness, internal continuity, and rationality of the questionnaires were checked by the investigators.

#### Sample size calculation

The sample size was calculated based on item-respondent theory, in which a ratio of 1:5 up to 1:20 is considered suitable [22]. In this study, a ratio of 1:15 was selected and, with 34 KAP items of the questionnaire (not counting demographics information), the required sample size was 510. Considering a possible 15% invalid rate, the minimal sample size was 580.

#### Statistical analyses

SPSS 26.0 (IBM Corp., Armonk, N.Y., USA) was used for the statistical analysis. Continuous data were expressed as mean  $\pm$  standard deviation (SD) and compared by t-test. Categorical data were expressed as n (%), and compared by the Chi-square test. ANOVA was Page 9 of 40

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used for comparison among multiple groups. Validation factor analysis was conducted to confirm the factorial structure of the designed KAP questionnaire and assess effect size of each item. Several indices indicated a good model fit for the construct, including: standardized root mean residual (SRMR)  $\leq 0.08$ , root mean square error of approximation (RMSEA)  $\leq 0.08$ , comparative fit index (CFI) > 0.8, Tucker Lewis Index (TLI) > 0.8, and p > 0.05 for the chi-square test. A standardized factor loading greater than 0.5 and a P less than 0.05 indicated a strong relationship between items and their respective factors, thereby confirming the validity of the construct. The multivariate linear regression analysis was conducted to determine the influencing factors of knowledge and attitude. All the statistical analyses were two-sided, and differences with P < 0.05 were considered statistically significant.

#### Results

A total of 581 participants were recruited for this survey, including 171 males (29.43%) and 410 females (70.47%). Majority of participants were 21-30 years old (64.03%), registered in non-agricultural account (57.49% vs. 42.51%), and educated mainly in junior college/college (77.28%). Despite the differences in participants' occupations, more than 80% of them had average monthly income higher than RMB 5,000. Participants' reasons for surgical correction of visual acuity varied, with the top two being inconvenience in wearing spectacles (67.81%) and appearance improvement (40.96%). Notably, the number of individuals surveyed before and after refractive error surgery was different: 164 cases (28.23%) before surgery and 417 cases (71.77%) after surgery. Detailed sociodemographic characteristics of participants are showed in **Table 1**.

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# Table 1 Sociodemographic characteristics.

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$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		N (%)	Mean ± SD	p-value	Mean ± SD	p-value	
Sex         0.186         0.006           Male         171(29.43)         29.72±12.59         26.78±3.74           Female         410(70.57)         31.45±11.36         27.71±3.32           Age (years)         0.047         0.001 $\leq 20$ 97(16.7)         31.43±12.32         28.59±3.22           21-30         372(64.03)         31.47=11.58         27.25±3.37           >30         112(19.28)         28.78±1.69         27.06±3.82           Registered residence         0.542         0.001         0.016           Agriculture account         247(42.51)         30.41±12.24         26.89±3.63           Non-agriculture account         334(57.49)         31.33±11.38         27.85±3.30           Education level         52(8.95)         25.44±11.38         26.36±2.81           Junior college/college         449(77.28)         31.24±1.95         27.73±3.54           Postgraduate or higher         80(13.77)         32.65±9.83         27.43±3.38           Occupation, N (%)         0.418         0.294           Government administrators of the country or leaders of enterprises and public institutions         27.62±3.49         27.62±3.49           Clerks or relevant personnel         34(5.85)         31.55±11.29	Total score		30.95±11.76		27.45±3.48		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Sex			0.186		0.006	
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$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Agriculture account	247(42.51)	30.41±12.24		26.89±3.63		
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Army personnel $3(0.52)$ $25.33\pm20.10$ $28.66\pm3.21$ Housewife $9(1.55)$ $30.88\pm8.565$ $27.55\pm3.04$ Personnel in medical and relevant industry $27(4.65)$ $33.40\pm13.26$ $28.11\pm4.36$ Others $271(46.64)$ $29.69\pm12.53$ $27.38\pm3.55$ Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ $79(13.6)$ $29.36\pm11.92$ $26.54\pm3.80$ $5000-10000$ $232(39.93)$ $30.46\pm11.81$ $27.68\pm3.26$ $10000-20000$ $179(30.81)$ $31.97\pm11.75$ $27.43\pm3.55$ $\geq 20000$ $91(15.66)$ $31.51\pm11.43$ $27.61\pm3.46$ Daily screen usage time (h) $0.369$ $0.877$ $<4$ $102(17.56)$ $30.71\pm11.73$ $27.50\pm3.25$ $4-6$ $172(29.6)$ $30.62\pm10.78$ $27.47\pm3.65$ >6 $307(52.84)$ $31.20\pm12.30$ $27.40\pm3.45$ Reasons for surgical correction of visual acuity (multiple choices) $238(40.96)$ $10.238(40.96)$ Remove the glasses and improve $238(40.96)$ $10.238(40.96)$ $10.238(40.96)$	personnel						
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Personnel in medical and relevant industry $27(4.65)$ $33.40\pm13.26$ $28.11\pm4.36$ Others $271(46.64)$ $29.69\pm12.53$ $27.38\pm3.55$ Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ $79(13.6)$ $29.36\pm11.92$ $26.54\pm3.80$ $5000-10000$ $232(39.93)$ $30.46\pm11.81$ $27.68\pm3.26$ $10000-20000$ $179(30.81)$ $31.97\pm11.75$ $27.43\pm3.55$ $\geq 20000$ $91(15.66)$ $31.51\pm11.43$ $27.61\pm3.46$ Daily screen usage time (h) $0.369$ $0.877$ $<4$ $102(17.56)$ $30.71\pm11.73$ $27.50\pm3.25$ $4-6$ $172(29.6)$ $30.62\pm10.78$ $27.47\pm3.65$ $>6$ $307(52.84)$ $31.20\pm12.30$ $27.40\pm3.45$ Reasons for surgical correction of visual acuity (multiple choices) $238(40.96)$ $40.96$ Remove the glasses and improve $238(40.96)$ $40.96$ $40.96$	Housewife	9(1.55)	30.88±8.565		27.55±3.04		
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Monthly income per capita (Yuan) $0.232$ $0.137$ $\leq 5000$ 79(13.6) $29.36\pm11.92$ $26.54\pm3.80$ $5000-10000$ $232(39.93)$ $30.46\pm11.81$ $27.68\pm3.26$ $10000-20000$ $179(30.81)$ $31.97\pm11.75$ $27.43\pm3.55$ $\geq 20000$ 91(15.66) $31.51\pm11.43$ $27.61\pm3.46$ Daily screen usage time (h) $0.369$ $0.877$ $<4$ $102(17.56)$ $30.71\pm11.73$ $27.50\pm3.25$ $4-6$ $172(29.6)$ $30.62\pm10.78$ $27.47\pm3.65$ $>6$ $307(52.84)$ $31.20\pm12.30$ $27.40\pm3.45$ Reasons for surgical correction of visual acuity (multiple choices) $238(40.96)$ $10238(40.96)$ Remove the glasses and improve appearance $238(40.96)$ $1000000000000000000000000000000000000$	Others	271(46.64)	29.69±12.53		27.38±3.55		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Monthly income per capita (Yuan)			0.232		0.137	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	≤5000	79(13.6)	29.36±11.92		26.54±3.80		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	5000-10000	232(39.93)	30.46±11.81		27.68±3.26		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	10000-20000	179(30.81)	31.97±11.75		27.43±3.55		
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Daily screen usage time (h)			0.369		0.877	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	<4	102(17.56)	30.71±11.73		27.50±3.25		
>6307(52.84)31.20±12.3027.40±3.45Reasons for surgical correction of visual acuity (multiple choices)238(40.96)1Remove the glasses and improve appearance238(40.96)1	4-6	172(29.6)	30.62±10.78		27.47±3.65		
Reasons for surgical correction of visual acuity (multiple choices)       Image: Correction of visual acuity (multiple choices)         Remove the glasses and improve appearance       238(40.96)	>6	307(52.84)	31.20±12.30		27.40±3.45		
visual acuity (multiple choices)238(40.96)Remove the glasses and improve appearance238(40.96)	Reasons for surgical correction of	()					
Remove the glasses and improve 238(40.96) appearance	visual acuity (multiple choices)						
appearance	Remove the glasses and improve	238(40.96)					
	appearance						

Study in higher schools, job	126(21.69)				
selection, or joining the army					
Inconvenience in putting up and off	394(67.81)				
the glasses					
others	14(3.36)				
Surveyed before or after refractive error			<0.001		<0.001
surgery			~0.001		<0.001
Before	164(28.23)	27.37±11.73		26.60±3.26	
After	417(71.77)	32.35±11.47		27.77±3.50	
surgery Before After	164(28.23) 417(71.77)	27.37±11.73 32.35±11.47	<0.001	26.60±3.26 27.77±3.50	~0.001

Knowledge score evaluated in participants after surgery (possible range: 0~45) was significantly higher than those before surgery ( $32.35\pm11.48$  vs.  $27.38\pm11.74$ , P<0.001). Attitude score in participants after surgery (possible range: 0~36) was also significantly higher than in those before surgery ( $27.77\pm3.505$  vs.  $26.6\pm3.267$ , P<0.001). According to the knowledge and attitude scores, participants evaluated before surgery had insufficient knowledge but positive attitudes toward the procedure, and those evaluated postoperatively had sufficient knowledge and positive attitudes (**Table 1 and Figure 1**).

In participants before surgery, the top three in terms of accuracy rate for the questions under knowledge dimension were K15, K4, and K3, with the accuracy rates of 79.88%, 79.27%, and 78.66%, respectively, whereas K12 (29.27%), K13 (40.24%), and K6 (40.85%) were ranked the last three in the accuracy. In participants after surgery, except for K2, K3, K4, and K12 (P > 0.05), the accuracy rates of other questions under knowledge dimension were significantly higher compared with those surveyed before surgery (P < 0.05). Specifically, the three questions under knowledge dimension with the highest accuracy rates were K15 (88.25%), K4 (83.45%), and K2 (78.90%). And the three questions with the lowest accuracy rates were still K12, K13, and K6, with the accuracy of 37.89%, 57.31%, and 58.99%, respectively (**Table S1**). Regarding the distribution of attitude dimension, scores found in A1, A4, A5, A6, A8, and A9 in patients after surgery were significantly higher than in those surveyed before surgery (P < 0.05). For A2, A3, A4, A5, A6, and A8, more participants

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responded "highly positive" and "positive", while less people responded "negative" and "highly negative" (Table S2).

For the knowledge and attitude domains, the two-factor model demonstrated on **Figure S1** was tested by validation factor analysis. Satisfactory model fitness was demonstrated (**Table S3**) and final model demonstrated a strong relationship between items and attitude, as well as knowledge domain, with the composite reliability for all factors except K2, K4, K10 and K12 above the cut-off value of 0.7, as summarized in **Table S4**.

Additionally, in analysis of multivariate linear regression results, the knowledge scores were related to education level (Ref. senior middle school or lower; junior college/college, OR=5.81, 95% CI: 2.52-9.09, P=0.001; postgraduate or higher, OR=7.83, 95% CI: 3.83-11.8, P<0.001) and time of participants being surveyed (Ref. before refractive error surgery; after refractive error surgery, OR=5.09, 95% CI: 3.02-7.16, P<0.001) (**Table 2**). Different from the knowledge scores, the influencing factors of attitude scores included knowledge scores OR=0.05, 95% CI: 0.03-0.07, P<0.001), sex (Ref. male; female, OR=1.24, 95% CI: 2.52-9.09, P<0.001), age (Ref.  $\leq$ 20 years old; 21-30 years old, OR=-1.9, 95% CI: 2.52-9.09, P<0.001; >30 years old, OR=-2.5, 95% CI: -3.5--1.4, P<0.001), registered residence (Ref. agriculture account; non-agriculture account, OR=0.82, 95% CI: 0.22-1.42, P=0.007), monthly income (Ref.  $\leq$ RMB 5,000; RMB 5,000-10,000, OR=0.92, 95% CI: 0.06-1.78, P=0.036), and time of participants being surveyed (Ref. before refractive error surgery; after refractive error surgery, OR=0.86, 95% CI: 0.24-1.47, P=0.006) (**Table 3**).

Table 2 Multivariate	linear regression	analysis for	knowledge
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Knowledge	Univariate analysi	S	Multivariate analysis		
	β (95%CI)		β (95%CI)	p-value	
	$R^2 = 0.0$		$R^2 = 0.0570*$		
	F= 12.68 (P			01)	
Sex					
Male	Ref**	-	Ref	-	
Female	1.73(-0.36,3.83)	0.106			

T				
Age (years)				
≤20	Ref	-	Ref	-
21-30	0.03(-2.58,2.66)	0.978		
>30	-2.64(-5.84,0.54)	0.104		
Registered residence				
Agriculture account	Ref	-	Ref	-
Non-agriculture account	0.92(-1.0,2.85)	0.351		
Education level				
Senior middle school or lower	Ref	-	Ref	-
Junior college/college	5.80(2.45,9.14)	0.001	5.81(2.52,9.09)	0.001
Postgraduate or higher	7.42(3.34,11.4)	< 0.001	7.83(3.83,11.8)	< 0.001
Occupation, N (%)	, , , , , , , , , , , , , , , , ,			
Government administrators of the country or leaders of enterprises and public institutions	Ref	-	Ref	-
Professionals (teachers, engineering technicians, writers, etc.)	1.99(-3.14,7.13)	0.445		
Clerks or relevant personnel	0.80(-5.34,6.96)	0.796		
Personnel in commercial business or service	0.79(-4.68,6.27)	0.776		
Personnel in farming, forestry, animal husbandry, fishery, etc.	0.41(-6.78,7.61)	0.91		
Operators of production or transportation equipment, or relevant personnel	-0,			
Army personnel	-5.41(-19.5,8.72)	0.452		
Housewife	0.13(-8.88,9.16)	0.976		
Personnel in medical and relevant industry	2.65(-3.81,9.13)	0.421		
Others	-1.05(-5.96.3.86)	0.674		
Monthly income per capita (Yuan)				
<5000	Ref		Ref	_
5000-10000	1 09(-1 90 4 10)	0 473		
10000-20000	2.61(-0.50.5.72)	0.101		
>20000	2 14(-1 40 5 69)	0 235		
Daily screen usage time (h)	(1.10,0.07)			
<4	Ref	_	Ref	_
4-6	-0.09(-2.98.2.79)	0 949		
• • •		0.716		
>6	0.48(-2.15.3.13)	0/16		1
>6 Surveyed before or after refractive error surgery	0.48(-2.15,3.13)	0.716		
>6 Surveyed before or after refractive error surgery Before	0.48(-2.15,3.13) Ref	0./16	Ref	_

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Adjusted K-squarea; <sup>•</sup>Ref Variable used as a reference in the analysis

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 Table 3 Multivariate linear regression analysis for attitude.

	Univariate analysis Multivariate analysis					
Attitude	β (95%CI)	p-value	β (95%CI)	p-value		
		1	$R^2 = 0.1334*$	1		
			F = 5.70 (P < 0.001)			
Knowledge	0 07(0 05 0 09)	< 0.001	0.05(0.03.0.07)	<0.001		
Sex		0.001		0.001		
Male	Ref**	-	Ref	_		
Female	0.93(0.31.1.55)	0.003	1.24(0.59,1.89)	< 0.001		
Age (years)						
<u>≤20</u>	Ref	-	Ref	-		
21-30	-1.33(-2.11,-0.56)	0.001	-1.9(-2.8,-1.0)	< 0.001		
>30	-1.53(-2.47,-0.59)	0.001	-2.5(-3.5,-1.4)	< 0.001		
Registered residence						
Agriculture account	Ref	-	Ref	-		
Non-agriculture account	0.96(0.39,1.53)	0.001	0.82(0.22,1.42)	0.007		
Education level						
Senior middle school or lower	Ref	-	Ref	-		
Junior college/college	1.20(0.20,2.20)	0.018	0.99(-0.04,2.03)	0.061		
Postgraduate or higher	1.07(-0.14,2.28)	0.083	0.73(-0.57,2.05)	0.268		
Occupation, N (%)						
Government administrators of						
the country or leaders of	Ref	-	Ref	-		
enterprises and public institutions						
Professionals (teachers,						
engineering technicians, writers,	1.53(0.01,3.05)	0.047	1.21(-0.22,2.65)	0.098		
etc.)						
Clerks or relevant personnel	0.97(-0.84,2.79)	0.293	0.52(-1.20,2.24)	0.553		
Personnel in commercial	1.76(0.14,3.39)	0.033	1.45(-0.07,2.99)	0.063		
business or service						
Personnel in farming, forestry,						
Operators of production or						
transportation equipment or	0.80(1.32.2.03)	0.458	1 70( 0 37 3 77)	0 108		
relevant personnel	0.00(-1.52,2.95)	0.438	1.70(-0.37,3.77)	0.108		
Army personnel	2 58(-1 60 6 76)	0.226	2 41(-1 51 6 35)	0.228		
Housewife	1 47(-1 19 4 14)	0.220	1 14(-1 40 3 68)	0.220		
Personnel in medical and	1.17(1.17,1.17)	0.279	1.11(1.10,5.00)	0.577		
relevant industry	2.02(0.11,3.94)	0.038	1.53(-0.28,3.35)	0.097		
Others	1.29(-0.15,2.75)	0.081	0.82(-0.58,2.22)	0.25		
Monthly income per capita (Yuan)	, , , , , , , , , , , , , , , , , , , ,					
≤5000	Ref	-	Ref	_		
5000-10000	1.14(0.25,2.03)	0.011	0.92(0.06,1.78)	0.036		
10000-20000	0.89(-0.02,1.81)	0.057	0.52(-0.40,1.44)	0.269		
≥20000	1.07(0.02,2.11)	0.045	0.82(-0.22,1.86)	0.122		
Daily screen usage time (h)						
<4	Ref	-	Ref	-		

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4-6	-0.0(-0.8,0.82)	0.939		
>6	-0.1(-0.8,0.67)	0.79		
Surveyed before or after refractive				
error surgery				
Before	Ref	-	Ref	-
After	1.17(0.54,1.79)	< 0.001	0.86(0.24,1.47)	0.006
* A divised D. aguarad: ** Daf Varia	bla usad as a rafaran	as in the	maluaia	

\*Adjusted R-squared; \*\*Ref – Variable used as a reference in the analysis

The comparison of sociodemographic characteristics between participants before and after surgery showed significant difference in age (P<0.001) and reasons for surgical correction of visual acuity (P=0.006) (Table S5). Moreover, lower knowledge scores were more likely to be found in those who were male (P=0.001), aged more than 30 years old (P=0.018), and had senior middle school or lower education level (P=0.014) in participants surveyed before surgery. In those surveyed after surgery, the participants with senior middle school or lower education level had lower knowledge scores (P=0.017). Regarding attitude scores, the participants scored lower were male (P=0.006) in participants surveyed before surgery. In those surveyed after surgery, attitude scores differed by age (P=0.002) and registered L.C.Z.O.J. residence (P=0.001) (Table 4).

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Table 4	Knowledge	and	attitude	scores	surveyed	before	and	after	surgery	according	to
different	t baseline cha	racter	ristics.								

	Knowledge score			Attitude score				
	Before		After		Before		After	
Variables	surgery	p-valu	surgery	P-valu	surgery	p-valu	surgery	P-valu
	Mean ± SD	e	Mean ± SD	e	Mean ± SD	e	Mean ± SD	e
Total saora	27.38±11.7		32.35±11.4		26.6±3.26		27.77±	
	4		8		7		3.505	
Sex		0.001		0.616		< 0.001		0.052
Male	21.7±11.14		31.94±12.0 9		24.95±3.4 07		27.29± 3.687	
Female	29.03±11.4 3		32.54±11.1 9		27.09±3.0 73		28.00± 3.398	
Age (years)		0.018		0.266		0.986		0.002
≤20	25.6±13.09		32.50±11.9 52		26.67±3.7 92		28.95± 3.006	
21-30	28.65±11.0 5		32.93±11.6 00		26.61±3.3 22		27.59± 3.364	
>30	21.23±13.0 4		30.63±10.6 26		26.50±2.6 50		27.20± 4.059	
Registered residence		0.175		0.705		0.183		0.001
Agricultur e account	25.88±12.3 6		32.11±11.8 04		26.19±3.4 48		27.15± 3.672	
Non-agricu lture account	28.41±11.2 36		32.54±11.2 46		26.89±3.1 22		28.25± 3.303	
Education level		0.014		0.017	4	0.474		0.100
Senior middle school or lower	20.14±10.5 67		27.39±11.1 71		25.64±3.3 19		26.63± 2.604	
Junior college/colle ge	27.32±11.9 48		32.71±11.6 39		26.64±3.2 48		27.92± 3.596	
Postgradua te or higher	31.25±9.76 6		33.73±9.85 4		26.93±3.3 55		27.71± 3.397	
Monthly income per capita (Yuan)		0.321		0.504		0.179		0.126
≤5000	23.35±11.1 97		31.02±11.6 72		25.47±3.3 75		26.84± 3.893	
5000-1000 0	26.59±11.4 94		31.94±11.6 29		26.88±3.1 4		28.00± 3.270	
10000-200 00	28.80±12.2 81		33.54±11.2 10		26.27±3.3 36		28.01±3.5 37	
≥20000	28.83±11.2 12		32.48±11.4 43		27.50±3.2 17		27.66± 3.570	
Daily screen usage time		0.645		0.827		0.717		0.955

(h)								
<4	25.23±10.9 59		32.23±11.5 48		26.18±2.5 00		27.88± 3.354	
4-6	27.47±11.4 58		31.88±10.2 81		26.86±3.5 36		27.72± 3.687	
>6	27.84±12.1 17		32.67±12.1 26		26.57±3.2 98		27.77± 3.468	
Reasons for surgical correction of visual acuity								
Remove the glasses and improve appearance	29.60±11.5 54	0.085#	33.56± 10.251	0.056	27.53±2.9 56	0.010#	27.97± 3.383	0.308#
Study in higher schools, job selection, or joining the army	20.20±11.7 37	0.003#	30.93± 12.667	0.142	25.00±3.8 66	0.019#	27.81± 3.636	0.901#
Inconvenie nce in putting up and off the glasses	27.50±11.7 37	0.837#	33.58±10.4 58	0.004	26.42±3.0 93	0.271#	27.89± 3.312	0.334#
others	-	-	24.07± 13.697	0.006	-	-	26.43± 5.515	0.144#

<sup>#</sup>Comparison of participants' score between those who chose the option and did not.

#### Discussion

This study suggested that myope or their guardians had positive attitudes toward corrective surgery both before and after the procedure. The presence of insufficient knowledge among patients prior to refractive surgery underscores the critical need for targeted educational interventions to enhance understanding and informed decision-making before undergoing the procedure. Vulnerable groups were identified who would benefit from targeted education, including male myopes, older patients and those with lower education levels. These findings may provide inspiration and direction for ophthalmic education before the refractive surgery. In the present study, the majority of participants were females aged less than 30, which was consistent with the epidemiology of myopia reported in previous studies[23-25]. In addition, patients with higher educational level and longer daily screen usage time expressed strong

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desire for correction, in line with the previous study by Mirshahi *et al.* [26] discussing that people with higher educational achievements have higher prevalence of myopia and higher correction rate. At the same time in this study, individuals with lower levels of education were found to have less knowledge about refractive correction options. This highlights the presence of a smaller but more vulnerable subgroup within the population that is at greater risk of being under informed; moreover, they might be more susceptible to becoming victims of disinformation, as the Internet remains a primary source of information about myopia and its correction[11, 27]. These findings emphasize the critical need for targeted educational interventions tailored to address the specific needs of individuals with lower educational attainment, ensuring they are adequately informed about available corrective procedures and their implications.
A previous study among female students showed that the respondents had a high level of knowledge and awareness of refractive correction methods, especially refractive surgery [9]. Contrary to this result, the knowledge score and accuracy rates for questions under knowledge dimension in our study were low before surgery. After surgery, the knowledge

Contrary to this result, the knowledge score and accuracy rates for questions under knowledge dimension in our study were low before surgery. After surgery, the knowledge scores of the participants were significantly improved, which may be attributed to the preoperative conversation with the surgeon explaining the knowledge of refractive surgery – however, with the unknown source it is difficult to assess whether or not participants had enough knowledge to make an informed decision at the time of surgery. Interesting to note that our findings showed a good fit for the questionnaire, supporting the construct validity, but demonstrated lower composite reliability for K2, K4, K10 and K12 – while 3 of those items also did not differ before and after operation, suggesting that some gaps in knowledge might still be present even after surgery. It is concerning that, according to numerous surveys [3, 28, 29], female participants often choose to undergo refractive surgery primarily for aesthetic reasons, such as enhancing their appearance, rather than based on sufficient

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knowledge about the procedure. This lack of informed decision-making may place patients at a higher risk of encountering unnecessary complications or adverse outcomes associated with the surgery. Notably, the three questions under knowledge dimension with the lowest accuracy rates before and after surgery were K12, K13, and K6, which were related to indications and complications of refractive surgery. This might be linked to the fact suggested by previous cross-sectional study that patients were prone to refusing refractive surgery because of the fear of the surgical complications [30]. Without a comprehensive understanding of the potential benefits, risks, and limitations of the procedure, patients may be less prepared to make fully informed choices, which could compromise their overall safety and satisfaction with the surgical outcomes. Consequently, targeted education on the indications and complications of refractive surgery should be implemented.

In addition, this study found that the participants had continued positive attitudes toward refractive surgery both those who only planned procedure and those who already underwent it, in line with previous reports on high level of satisfaction and positive attitude about vision correction surgery [31, 32]. Of note, lower attitude scores were more likely to be observed in the participants who aged >30 years and had agriculture account. This may be at least partly attributed to the efficacy of refractive surgery for myopia associated with younger age and low myopia [33]. Patients with agriculture account are usually older and have higher myopia, thus the outcome of refractive surgery may be impaired. It is also worth noting that attitude scores were strongly influenced by knowledge scores, suggesting that enhancing education about myopia and refractive surgery might contribute to the development of positive attitudes. As many previous studies demonstrated that the refractive surgeries achieved favorable visual outcomes in the correction of myopia [34-36], with adequate education and the empowerment of their attitudes, individuals with myopia would be better equipped to make informed decisions regarding refractive surgery, gaining a clearer understanding of its

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efficacy, as well as its potential advantages and disadvantages. Additionally, while the present survey was not explicitly designed as an educational intervention, we believe that the process of answering the questionnaire can itself stimulate reflection and awareness. By engaging with the questions, participants are exposed to information or concepts they may not have previously considered, which could prompt them to think more deeply about their condition, as was demonstrated before [37]. This inherent potential to influence awareness and attitudes, even if minimally, supports the idea that completing such questionnaire could be recommended as a potential educational intervention.

There are some limitations in the present study. First, the setting of the trial was in eastern province with relatively developed economy and society, limiting the wider generalizability of the results of our study. Second, due to using a self-designed questionnaire, bias and overestimation of real results may be introduced by responder and some variables related to knowledge and attitude scores may be neglected. Although additional validation factor analysis was conducted to assess the factorial structure of the questionnaire and results demonstrating good validity and reliability, using a convenience sample for both questionnaire validation and measuring results may introduce additional bias, potentially affecting the reliability of the validation process and the generalizability of the findings. Thirdly, as a result of cross-sectional design characteristics, the relationship between knowledge and attitude toward different variables was not specifically determined. Finally, the difference in numbers and the consist of individuals between the preoperative and postoperative groups (there are significant differences in their ages and reasons for surgical correction of visual acuity) could introduce some bias, and a larger preoperative sample size would improve the robustness of future analyses, furthermore, in the future, we will design to keep the preoperative and postoperative groups the same population for investigation.

#### Conclusion

To summarize, myope or their guardians showed positive attitudes towards corrective surgery both before and after surgery. The presence of insufficient knowledge among patients prior to refractive surgery underscores the critical need for targeted educational interventions to enhance understanding and informed decision-making before undergoing the procedure. Empowering attitude and addressing some of the beliefs and concerns of patients with myopia or their guardians may further encourage patients to seek medical help.

#### List of abbreviations

Knowledge, attitudes, and practices KAP

Standard deviation SD

#### **Declarations**

#### Ethics approval and consent to participate

All procedures were performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This study was approved by the Ethics Committee of The First Affiliated Hospital of Soochow University [No.321 (2023)]. All methods were carried out in accordance with relevant guidelines and regulations.

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#### **Consent for publication**

Informed consents were obtained from all the participants.

#### Availability of data and materials

All data generated or analysed during this study are included in this published article [and its supplementary information files].

#### **Competing interests**

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> The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Authors' contributions

(I) Conception and design: YF Q

(II) Administrative support: YF Q

(III) Provision of study materials or patients: YF Q

(IV) Collection and assembly of data: All authors

(V) Data analysis and interpretation: All authors

(VI) Manuscript writing: All authors

J.C.Z.ONJ (VII) Final approval of manuscript: All authors

(VIII)YF Q is the guarantor.

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## Figure Legends

Figure 1 Comparison of knowledge (A), attitude (B) scores between evaluated before and after surgery

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**Figure S1** Two-factor model demonstrating the relationship between items and their respective factors according to the validation factor analysis.

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1 2 3	Table S1 Knowledge dimension			right, inclu		
4 5	Knowledge	Before surger	<b>y</b>	After surgery	p-value	
6	V1	Accuracy rate	e, N (%)	Accuracy rate N		
7	KI K2	93	J0./1 72.17		0.0 0.128	
8	K2 K3	120	73.17	329 <b>6 1</b> 1 327 <b>S S</b> 2	2.30 0.138	
9	KJ KA	129	70.00		345 0.234	
10	K4 K5	85	51.83	277 are	43 0.001	
11	KG	67	40.85	217 <b>6 39</b> 246 <b><del>-</del> <b>9</b></b>	<b>R</b> 99 <0.001	
12	K7	83	50.61	282 tr (05	7.63 <0.001	
13	K8	107	65.24	314	0.015	
14	K9	96	58.54	303 and	2.66 0.001	
15	K10	86	52.44	278	5.67 0.001	
10	K11	94	57.32	276 at Da	6.19 0.045	
18	K12	48	29.27	158	2.89 0.055	
19	K13	66	40.24	239	.31 <0.001	
20	K14	108	65.85	310 310	.34 0.040	
21	K15	131	79.88	368 🛃 8	8.25 0.009	
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Table S2 Atti	tude dimension Highly pos	sitive (4 points)	Positive (	3 points)	Neutral (2	2 points)	Negati	ve (1 perint)	Highly	negative (0	n-vəlu
Attitude	% (before	/after surgery)	% surgery)	(before/after	% surgery)	(before/after	% surger	(before/after	%	(before/after	e e
A1	0.61	2.88	14.63	36.21	65.24	53.96	16.46	5.04 <u>5 series</u>	3.05	1.92	< 0.001
A2	40.85	52.76	53.05	42.45	6.10	4.32	0.00	0.24 <b>eign</b> 20	0.00	0.24	0.056
A3	45.73	55.88	50.61	40.05	3.05	3.84	0.61	0.24 <b>6 19 25</b>	0.00	0.00	0.079
A4	35.37	49.88	53.66	44.60	9.76	5.04	1.22	0.24 <b>5</b> 9 0	0.00	0.24	0.003
A5	32.93	55.88	60.37	41.49	6.71	2.40	0.00	0.24 to S	0.00	0.00	< 0.001
A6	32.93	48.92	55.49	44.12	11.59	6.24	0.00	0.72 to 5	0.00	0.00	0.001
A7	2.44	3.12	16.46	11.51	40.85	37.89	31.71	35.0 <b>5</b> si a	8.54	12.47	0.336
A8	79.27	56.59	10.37	34.53	9.76	6.24	0.61	2.40 <b>0 t</b> č	0.00	0.24	< 0.001
A9	13.41	24.22	53.66	58.51	31.71	15.83	1.22	0.96 <b>5</b> 2	0.00	0.48	< 0.001
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Indicators	Reference	Results
RMSEA	<0.08 Good	0.061
SRMR	<0.08 Good	0.068
TLI	>0.8 Good	0.872
CFI	>0.8 Good	0.884

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52 52
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#### Table S4 Results of validation factor analysis

		Estimate	P> z
K1	Knowledge	1	
K2	Knowledge	0.40	< 0.001
K3	Knowledge	0.75	< 0.001
K4	Knowledge	0.63	< 0.001
K5	Knowledge	1.08	< 0.001
K6	Knowledge	1.23	< 0.001
K7	Knowledge	0.91	< 0.001
K8	Knowledge	1.08	< 0.001
K9	Knowledge	1.00	< 0.001
K10	Knowledge	0.69	< 0.001
K11	Knowledge	1.19	< 0.001
K12	Knowledge	0.51	< 0.001
K13	Knowledge	1.25	< 0.001
K14	Knowledge	1.11	< 0.001
K15	Knowledge	0.73	< 0.001
A1	Attitude	1	
A2	Attitude	2.37	< 0.001
A3	Attitude	2.38	< 0.001
A4	Attitude	2.72	< 0.001
A5	Attitude	2.35	< 0.001
A6	Attitude	2.30	< 0.001
A7	Attitude 🔿	-0.93	< 0.001
A8	Attitude	0.99	< 0.001
A9	Attitude	1.75	< 0.001

22.56 77.44 9.15 77.44 13.41 40.85 59.15 8.54 74.39 17.07	134 283 82 245 90 180 237 38 327 52	32.13 67.87 19.66 58.75 21.58 43.17 56.83 9.11 78.42	0.0 <0. 0.0
22.56 77.44 9.15 77.44 13.41 40.85 59.15 8.54 74.39 17.07	134 283 82 245 90 180 237 38 327 52	32.13 67.87 19.66 58.75 21.58 43.17 56.83 9.11 78.42	<0. 0.0
9.15 77.44 9.15 77.44 13.41 40.85 59.15 8.54 74.39 17.07	283 82 245 90 180 237 38 327 52	67.87 19.66 58.75 21.58 43.17 56.83 9.11 78.42	<0. 0.0
9.15 77.44 13.41 40.85 59.15 8.54 74.39 17.07	82 245 90 180 237 38 327 52	19.66 58.75 21.58 43.17 56.83 9.11 78.42	<0. 0.0
9.15 77.44 13.41 40.85 59.15 8.54 74.39 17.07	82 245 90 180 237 38 327 52	19.66 58.75 21.58 43.17 56.83 9.11 78.42	0.0
77.44 13.41 40.85 59.15 8.54 74.39 17.07	245 90 180 237 38 327 52	58.75 21.58 43.17 56.83 9.11 78.42	0.0
13.41 40.85 59.15 8.54 74.39 17.07	90 180 237 38 327 52	21.58 43.17 56.83 9.11 78.42	0.0 0.3
40.85 59.15 8.54 74.39 17.07	180 237 38 327 52	43.17 56.83 9.11 78.42	0.0
40.85 59.15 8.54 74.39 17.07	180 237 38 327 52	43.17 56.83 9.11 78.42	0
59.15 8.54 74.39 17.07	237 38 327 52	56.83 9.11 78.42	0.
8.54 74.39 17.07	38 327 52	9.11 78.42	0.3
8.54 74.39 17.07	38 327 52	9.11 78.42	0
74.39 17.07	327 52	78.42	
17.07	52	/ ( /	
17.07	52	12 47	
		12.17	0 ′
10.37	62	14 87	0.2
30.02	168	14.07	
35.02	120	40.27 28 78	
14.63	67	26.76	
14.05	07	10.07	0 ′
13/11	80	10 18	0
20.88	123	29.50	
27.00 56 71	214	51 32	
50.71	214	51.52	0.
33 54	183	43.88	0.
12.20	105	25 42	
70.73	278	23. <del>4</del> 2 66.67	
10.15	1/	3 36	
	33.54 12.20 70.73	33.54 183 12.20 106 70.73 278 - 14	33.54       183       43.88         12.20       106       25.42         70.73       278       66.67         -       14       3.36

Table S5 The comparison of sociodemographic characteristics between participants before and after surgery.

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		n-2024-( yright,	
Appendix		09212	
Dear patient,		ing for	
We are investigators from the Ophthalmology	Department of First Affiliated Hospital of	Soochow Driversity, and t	his questionnaire was
designed by us to investigate the awareness of indivi	iduals underwent refractive surgery in out he	ospital ang Boguardians on s	surgeries for refractive
errors (myopia). The data collected by this question	naire are confidential, and your information	will not accurate a second so ple	ease don't worry about
it. The data provided by you will only be used for	the survey, which could help providing evi	dence for the sc	cientific interventional
strategies. To guarantee the validity of this survey	y, please answer the questions according to	your ow	nk you very much for
making time to participate in this survey, and we ap	opreciate your support and cooperation in thi	is study very much!	
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□ I aware and consent that the data collected	in this survey will be used for the scientific	study.	
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	The	e First Part: Basic information
	1. Your sex:	a. Male
		b. Female <b>c y</b>
	2. Your age (years):	a. <20
		b. 21-30
		b. 31-40
		c. 41-50
		d. >50
	3. Who is receiving the refractive surgery:	a. Myself
		b. My child
	4. Registered residence:	a. Agriculture
		b. Non-agriculture
	5. Educational level:	a. Junior middle school or low
		✓ C b. Senior middle school/ technite al school
		c. Junior college/college
		d. Postgraduate or higher
	6. Occupation:	a. Government administrators of the country or leaders of enterprises
	-	and public institutions $\mathbf{\hat{\omega}}$
		b. Professionals (teachers, engineering technicians, and writers, etc.)
		c. Clerks or relevant personnel
		d. Personnel in commercial bus ness or service
		e. Personnel in farming, forestr $\mathbf{\hat{g}}$ , a main husbandry, or fishery, etc.
		f. Operators of production or gransportation equipment, or relevant
		personnel
		g. Army personnel
		h. Housewife
		i. Personnel in medical and relevan Eindustry
		j. Others
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7. The monthly income of your family per capita in the past year (including physical income and rental income): Yuan	a.<2000 b 2000-5000
	c.5000-10000 for 27 d.10000-20000 uses e. e.>20000 rec.
8. The degree of myopia before surgery (Please report the degree of you	ur child if you are a parent): Left
9. Daily time of screen usage, including the use of cellphone, iPad, computer, or television, etc. (Please report the time of your child if you are a parent):	a. $<2 h$ d modelb. 2-4 hto Superiorc. 4-6 hand guidedd. $>6h$ d d
10. Which are the reasons that you want to correct the visual acuity by refractive surgery?	a. Remove the glasses and improve the appearance b. Study in higher schools, job by the pearance c. Inconvenience in putting up and off the glasses
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	gies.
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	The Second Part: Knowledge on refractive (myopia) surgery 흔 .
	K1. Refractive surgeries mainly include two types, i.e. corneal refractive surgery and implantable contage legs (ICL).
	a. Right b. Wrong c. Unclear 약 것
	K2. All myopia patients aged >18 years wanting to remove the glasses can receive refractive surgery. $\frac{800}{200}$
	a. Right b. Wrong c. Unclear
	to to be
	K3 Laser surgery for myonia is a "subtraction surgery" while ICL is an "addition surgery"
	a. Right b. Wrong c. Unclear
	K4. Patients need to stop wearing contact lenses before surgery. Generally, wearing of soft lenses (regular contact lenses) should be stopped
	for 1 week, hard lenses such as RGP should be stopped for 1 month, and orthokeratology lenses should Expoped for more than 3 months.
	a. Right b. Wrong c. Unclear
	K5. Range of diopters that can be corrected by excimer laser surgery: myopia less than 1200 degree, Atignatism less than 600 degree, and
	hyperopia less than 600 degree.
	a. Right b. Wrong c. Unclear
	K6. For excimer laser surgery, the cornea need to by >450 nm, and the anticipated thickness of residual corneal flap after the surgery is >250
	um (>280 um is recommended), and should be >50% of the thickness before surgery.
	a. Right b. Wrong c. Unclear
	K7. For patients with relatively thin cornea, high degree of myopia, with no other contraindications, and meet the requirements of surgical
	parameters, semi-femtosecond laser surgery could be selected.
	a. Right b. Wrong c. Unclear $\overline{58}$
	parameters, or myopia >1000 degrees
	a Right b Wrong c Unclear
	K9 Full femtosecond laser surgery is suitable for myope of 100-1000 degrees and astigmatism <500 degrees
	a. Right b. Wrong c. Unclear
	K10. Full femtosecond laser surgery is suitable for patients loving strenuous exercises, fighting and boxing, and competitive sports, or specific
	que
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individuals. a. Right b. Wrong c. Unclear	2125 or
K11. ICL surgery has the characteristic of reversible and is suitable for correcting myopia with or wigh preferred method for correcting high-grade myopia >1000 degrees. Patients with moderate- or low-degrees could select the method according to their own conditions. a. Right b. Wrong c. Unclear	hour astigmatism. ICL surgery is the emotions for the indications of t
K12. The follows are complications of risks after refractive surgery: 1) xerophthalmia; 2) corneal subepting regression, and become myopia again; 5) difficult in reading; 6) residual diopters after surgery; 7) dry expression, and difficult in driving in the night. How many of them do you know? a. $\geq$ 7; b.5-7; c.1-4; d. none at all	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
K13. For superficial excimer laser surgery (such as LASEK or TPRK, etc.), the degree of correction shows surgery is more suitable for several specific conditions, such as patients with corneal scars and opacity dystrophy. However, the discomfort in the eyes after surgery is substantial, the recovery cycle is relative of corneal stroma opacity. a. Right b. Wrong c. Unclear	The no higher than 800 degrees. The es, for epithelial basement membrane by bong, and the patients have the risk
K14. The range of diopters that can be corrected by semi-femtosecond laser surgery is large, during the to make the flaps, and the postoperative risk of corneal complications is higher than other correction methods the eyes after surgery could potentially damage the cornea, and emergent treatment is needed for severe a. Right b. Wrong c. Unclear	ases.
K15. Full femtosecond SMILE surgery involves minimally invasive injury (the smallest is 2 cm), the capsulorhexis area is large, and the cornea is safe and stable after surgery. a. Right b. Wrong c. Unclear	ocess of surgery is fast, the effective
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	py rice
1 2	3ht,
3	The Third Part Attitude on refractive (myopia) surgery
4 5	A1. Your awareness on refractive surgery.
6	a. Highly unaware; b. Unaware; c. Fair; d. Aware; e. Highly aware $\vec{c}$
7	A2. Are you satisfied to the preoperative examination processes?
8 9	a. Highly satisfied; b. Satisfied; c. Fair; d. Unsatisfied; e. Highly unsatisfied
10	A3. Are you satisfied to the explanations by the personnel from the hospital?
11	a. Highly satisfied; b. Satisfied; c. Fair; d. Unsatisfied; e. Highly unsatisfied $33$
12	A4. Do you agree that you have fully understood the detailed processes of this surgery before the surger before the surg
14	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
15 16	A5. Do you agree that you think you have selected the most suitable surgical type?
17	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
18	A6. Do you agree that in your case, the advantages of the myopia correction surgery overwhelm the disation tages?
19 20	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
21	A7. Do you agree that advertisements could influence you in understanding the myopia correction surge
22	a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree
23 24	A8. How do you think the effects of the myopia surgery?
25	a. Highly effective, and the visual acuity recovered to normal level; b. Effective but not very substantiag; 😴. Effective but with substantial side
26	effects; d. Effective, but refractive regression occurred; e. Not effective at all
27 28	A9. Will you recommend the myopia correction surgery to your friends with myopia?
29	a. Strongly recommend; b. Recommend; c. Fair; d. Not recommend; e. Highly not recommend
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# Knowledge and attitude of myope or their guardians toward refractive surgery in Suzhou, China: a cross-sectional survey

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Keywords:	Knowledge, Attitude, Myopia, Cataract and refractive surgery < OPHTHALMOLOGY





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Knowledge and attitude of myope or their guardians toward refractive surgery in Suzhou, China: a cross-sectional survey

Running title: KA on refractive surgery.

# Liqian Mu<sup>1</sup>, Yifeng Qian<sup>2\*</sup>

<sup>1</sup>Department of General Surgery, the First Affiliated Hospital of Soochow University, Suzhou, China.

<sup>2</sup>Department of Ophthalmology, the First Affiliated Hospital of Soochow University, Suzhou, China.

## \*Corresponding author

Yifeng Qian

Department of Ophthalmology, the First Affiliated Hospital of Soochow University, Suzhou,

China.

Email: qianyifeng@suda.edu.cn

#### Abstract

**Background:** Refractive surgery is gaining widespread popularity; however, there remains a limited understanding of the knowledge and attitudes of myopes regarding these procedures.

**Objectives:** To investigate the knowledge and attitudes of myopes or their guardians toward refractive surgery.

**Design:** Cross-sectional study.

**Participants:** 581 myopes or their guardians in Suzhou City, Jiangsu Province, China, surveyed between August and October 2022.

**Outcome Measures:** Knowledge and attitude scores before and after refractive surgery, ranging from 0 to 45 and 0 to 36, respectively.

**Results:** Post-surgery knowledge ( $32.35 \pm 11.48$  vs.  $27.38 \pm 11.74$ , P < 0.001) and attitude ( $27.77 \pm 3.505$  vs.  $26.6 \pm 3.267$ , P < 0.001) scores were significantly higher than pre-surgery scores. Participants showed insufficient knowledge but positive attitudes preoperatively, with significant improvements postoperatively. Factors influencing knowledge scores included education level (Ref. senior middle school or lower; junior college/college, OR=5.81, 95% CI: 2.52-9.09, P=0.001; postgraduate or higher, OR=7.83, 95% CI: 3.83-11.8, P<0.001) and survey timing (after refractive error surgery, OR=5.09, 95% CI: 3.02-7.16, P<0.001), while attitude scores were influenced by knowledge scores (OR=0.05, 95% CI: 0.03-0.07, P<0.001), gender (female, OR=1.24, 95% CI: -2.8--1.0, P<0.001), age (21-30 years old, OR=-1.9, 95% CI: 2.52-9.09, P<0.001; >30 years old, OR=-2.5, 95% CI: -3.5--1.4, P<0.001), and survey timing (after refractive error surgery, OR=0.86, 95% CI: 0.24-1.47, P=0.006).

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**Conclusions:** Myopes or their guardians had positive attitudes toward refractive surgery both pre- and postoperatively. Insufficient knowledge prior to refractive surgery underscores the critical need for informed decision-making before undergoing the procedure.

Keywords: knowledge, attitude, refractive surgery, myopia, cross-sectional study

# Strengths and limitations of this study

- Comparatively big sample size (581 participants) ensures robust statistical power and generalizability of findings.

- Comprehensive assessment of both knowledge and attitudes provides a holistic view of patient perspectives on refractive surgery.

- Study setting in a relatively developed eastern province in China which might limit generalizability to other regions with different economic and social conditions.

- Use of a self-designed questionnaire may introduce bias and overestimate results,

potentially overlooking important variables related to knowledge and attitude.

#### Background

Refractive error (RE) is one of the most common ophthalmologic disorders among children and adolescents worldwide, and include myopia, hyperopia, and astigmatism[1]. It is reported that nearly 2.3 billion people worldwide live with refractive error, and this number is rising as the prevalence of myopia increases[2]. It is well-known that a high rate of myopia occurs in East and Southeast Asian schoolchildren and young adults, with 67.3% of grade 7 children and 83.2% of university students affected in central China[3]. High or pathologic myopia represents a significant concern as it can lead to irreversible visual impairment and, in severe cases, blindness, imposing substantial physical, emotional, and economic burdens on individuals, families, and society [4].

At present, the main methods of myopia correction include spectacles, contact lenses, and refractive surgery [5]. Recent studies discuss many disadvantages of spectacles, reported by myopes, such as inconvenience, limited vision, and low resolution, while the use of contact lenses may increase the risk of suffering from conjunctivitis, keratitis, and other eye diseases[6, 7]. Compared with spectacles and contact lenses, refractive surgery was shown to correct the refractive error permanently [8]. However, in the face of emerging popularity, there are many expectations and concerns regarding the procedure and its outcome. In particular, a number of patients may refuse refractive surgery due to the lack of information about correction methods and fear of complications [9, 10]. Another study in 2021 demonstrated that although refractive surgery is a common surgical procedure, patients undergoing it have a limited knowledge with the Internet as the main source of information [11]. According to knowledge, attitudes, and practices (KAP) theory, knowledge is the basis for behavior change, and beliefs and attitudes are the driving force for behavior change [12-14]. Therefore, it is helpful to find out and improve the knowledge and attitude of

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patients toward refractive surgery, which may contribute to easing their worries associated with the surgery and facilitate informed decision-making.

A majority of previous studies are focused on exploring the efficacy of different control or treatment methods for myopia[15-17], but, to the best of our knowledge, there is no study evaluating both preoperative and postoperative knowledge and attitude of Chinese patients towards refractive surgery. Accordingly, the purpose of this study was to investigate the knowledge and attitude of the patients or their guardians both before and after refractive surgery.

#### **Methods**

# Patient and public involvement

In the design, implementation, and dissemination of this study, we actively involved patients and the public. Initially, during the design phase, we conducted focus group discussions with individuals who had undergone refractive surgery and their guardians to understand their knowledge levels, attitudes, and informational needs regarding refractive surgery. This ensured that our survey content was both comprehensive and relevant to real-world experiences. To enhance the acceptability and response rate of the survey, we incorporated feedback from potential participants, simplifying language and optimizing question structure. Post-surgery, we also invited a subset of participants to review preliminary findings, ensuring our results accurately reflected their experiences and perspectives. For effective dissemination of our research findings, we plan to share the conclusions through various platforms such as social media, community health talks, and local healthcare networks. The aim is to increase public awareness about refractive surgery and encourage informed decision-making among potential patients. By involving patients and the public throughout the research process, we not only enhanced the relevance and practicality of our study but Page 7 of 41

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also fostered better communication and trust between healthcare providers and patients. These efforts underscore the importance of engaging end-users in medical research to improve outcomes and satisfaction.

#### Study design and participants

This cross-sectional study included myope or their guardians between August and October of 2022 in Suzhou city, Jiangsu Province, China. The participants of this study were randomly selected from ophthalmology department at the author's Hospital. The inclusion criteria were as follows: 1) those who plan refractive surgery in the next 6 months or had undergone refractive surgery (if the myope less than 18 years old, his/her guardian will participate in this survey instead); 2) those who can understand and complete questionnaires; 3) those who volunteer to participate. This study was approved by the Ethics Committee of the author's Hospital. Informed consents were obtained from all participants.

#### Procedures

Convenience sampling was adopted to select the participants from the Ophthalmology department of the author's Hospital, and then a self-designed questionnaire was used for the investigation. The questionnaire was designed based on the *Ophthalmology (the 9<sup>th</sup> version in 2018)* [18] and *Ophthalmic Surgery (the 4<sup>th</sup> version in 2014)* [19], and modified according to the suggestions of two experts. A pilot survey was performed in a small scale (with 50 questionnaires dispatched), and the validity and reliability were assessed. The Cronbach's alpha ( $\alpha$ ) of the questionnaire was 0.8547, indicating that the internal consistency of the questionnaire was satisfactory [20].

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The final questionnaire (**Appendix**) contained 34 items distributed in 3 dimensions. The dimension for baseline information included 10 items. The knowledge dimension included 15 items, with each correct answer corresponding to 3 point, and 0 point for wrong or unclear answer, and the total score for knowledge was 0-45 points; The attitude dimension included 9

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items, and the 5-level Likert scale was used for scoring. The selection of "Highly unaware, or highly agree" for items 1 and 7 was assigned 0 point, the selection of "Unaware, or agree" was assigned 1 point, the selection of "fair, or don't care" was assigned 2 points, the selection of "aware, or disagree" was assigned 3 points, and "Highly aware" or "Highly disagree" was assigned 4 points. For items 2, 3, 4, 5, 6, 8, 9, the scores were assigned in reverse to the scores for items 1 and 7. The maximal total score for attitude was 0-36 points. Based on the cut-off adopted by previous KAP studies [9, 21], knowledge score less than 70% of the maximal score was considered "insufficient knowledge", and more than 70% was "sufficient knowledge". For the attitude score, less than 50% of the total score was considered "negative attitude", 50-70% was "moderate attitude", and more than 70% was "positive attitude".

The on-line questionnaire was established by the SoJump APP software on WeChat, and a QR code was generated to allow the data collection through WeChat. The participants scanned the QR code and filled out the questionnaire. To ensure the quality and completeness of the questionnaire survey, each IP was allowed to submit the answer only once, and all items were mandatory for participants. The completeness, internal continuity, and rationality of the questionnaires were checked by the investigators.

#### Sample size calculation

The sample size was calculated based on item-respondent theory, in which a ratio of 1:5 up to 1:20 is considered suitable [22]. In this study, a ratio of 1:15 was selected and, with 34 KAP items of the questionnaire (not counting demographics information), the required sample size was 510. Considering a possible 15% invalid rate, the minimal sample size was 580.

#### Statistical analyses

SPSS 26.0 (IBM Corp., Armonk, N.Y., USA) was used for the statistical analysis. Continuous data were expressed as mean  $\pm$  standard deviation (SD) and compared by t-test. Categorical data were expressed as n (%), and compared by the Chi-square test. ANOVA was

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used for comparison among multiple groups. Validation factor analysis was conducted to confirm the factorial structure of the designed KAP questionnaire and assess effect size of each item. Several indices indicated a good model fit for the construct, including: standardized root mean residual (SRMR)  $\leq 0.08$ , root mean square error of approximation (RMSEA)  $\leq 0.08$ , comparative fit index (CFI) > 0.8, Tucker Lewis Index (TLI) > 0.8, and p > 0.05 for the chi-square test. A standardized factor loading greater than 0.5 and a P less than 0.05 indicated a strong relationship between items and their respective factors, thereby confirming the validity of the construct. The multivariate linear regression analysis was conducted to determine the influencing factors of knowledge and attitude. All the statistical analyses were two-sided, and differences with P < 0.05 were considered statistically significant.

#### Results

A total of 581 participants were recruited for this survey, including 171 males (29.43%) and 410 females (70.47%). Majority of participants were 21-30 years old (64.03%), registered in non-agricultural account (57.49% vs. 42.51%), and educated mainly in junior college/college (77.28%). Despite the differences in participants' occupations, more than 80% of them had average monthly income higher than RMB 5,000. Participants' reasons for surgical correction of visual acuity varied, with the top two being inconvenience in wearing spectacles (67.81%) and appearance improvement (40.96%). Notably, the number of individuals surveyed before and after refractive error surgery was different: 164 cases (28.23%) before surgery and 417 cases (71.77%) after surgery. Detailed sociodemographic characteristics of participants are showed in **Table 1**.

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# Table 1 Sociodemographic characteristics.

		Knowledge so	core	Attitude score		
	N (%)	Mean ± SD	p-value	Mean ± SD	p-value	
Total score		30.95±11.76		27.45±3.48		
Sex			0.186		0.006	
Male	171(29.43)	29.72±12.59		26.78±3.74		
Female	410(70.57)	31.45±11.36		27.71±3.32		
Age (years)			0.047		0.001	
<u>≤20</u>	97(16.7)	31.43±12.32		28.59±3.22		
21-30	372(64.03)	31.47±11.58		27.25±3.37		
>30	112(19.28)	28.78±11.69		27.06±3.82		
Registered residence			0.542		0.001	
Agricultural household registration	247(42.51)	30.41±12.24		26.89±3.63		
Non-agricultural household	224(57.40)	21.22 11.20		27.05.2.20		
registration	334(57.49)	31.33±11.38		$27.85\pm3.30$		
Education level			0.001		0.016	
Senior middle school or lower	52(8.95)	25.44±11.38		26.36±2.81		
Junior college/college	449(77.28)	31.24±11.95		27.57±3.54		
Postgraduate or higher	80(13.77)	32.86±9.833		$27.43\pm3.38$		
Occupation, N (%)			0.418		0.294	
Government administrators of the			00		0, .	
country or leaders of enterprises and	24(4 13)	$30.75 \pm 10.17$		$26.08 \pm 3.72$		
public institutions	2 ((	20.70-10.17		20.00-3.72		
Professionals (teachers engineering						
technicians writers etc.)	127(21.86)	$32.74 \pm 10.60$		$27.62 \pm 3.49$		
Clerks or relevant personnel	34(5.85)	31.55±11.29		27 05±2 83		
Personnel in commercial business or						
service	68(11.7)	$31.54 \pm 11.30$		$27.85\pm3.22$		
Personnel in farming, forestry,	,					
animal husbandry, fishery, etc.	/	4				
Operators of production or						
transportation equipment, or relevant	18(3.1)	31.16±8.826		26.88±2.51		
personnel						
Army personnel	3(0.52)	25.33±20.10		28.66±3.21		
Housewife	9(1.55)	30.88±8.565		27.55±3.04		
Personnel in medical and relevant	27(4.65)	22.40+12.20		20.11+4.26		
industry	27(4.65)	$33.40 \pm 13.26$		$28.11\pm4.36$		
Others	271(46.64)	29.69±12.53		27.38±3.55		
Monthly income per capita (Yuan)			0.232		0.137	
≤5000	79(13.6)	29.36±11.92		26.54±3.80		
5000-10000	232(39 93)	30.46±11.81		27.68±3.26		
10000-20000	179(30.81)	31.97±11.75		27.43±3.55		
>20000	91(15.66)	$31.51\pm11.43$		$27.61\pm3.46$		
Daily screen usage time (h)	, , , , , , , , , , , , , , , , , , , ,	21.01-11.13	0 369	27.01-0.10	0.877	
<4	102(17.56)	30 71+11 73	0.007	27 50+3 25	0.077	
4-6	172(29.6)	$30.62\pm10.78$		27 47+3 65		
>6	307(52.84)	$31.20\pm12.30$		27 40+3 45		
Reasons for surgical correction of	<u> </u>	51.20-12.30		<u>_</u> ,.io_J. <del>T</del> J		
visual acuity (multiple choices)						
Remove the glasses and improve	238(40.96)					
appearance						
	0	I	1	I	1	
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26(21.69)				
94(67.81)				
4(3.36)				
		<0.001		<0.001
		<0.001		<0.001
64(28.23)	27.37±11.73		26.60±3.26	
17(71.77)	32.35±11.47		27.77±3.50	
2	26(21.69) 94(67.81) 4(3.36) 54(28.23) 7(71.77)	26(21.69) 24(67.81) 4(3.36) 54(28.23) 27.37±11.73 7(71.77) 32.35±11.47	26(21.69)	26(21.69)          04(67.81)          4(3.36)          54(28.23)       27.37±11.73         26.60±3.26          7(71.77)       32.35±11.47         27.77±3.50

Knowledge score evaluated in participants after surgery (possible range: 0~45) was significantly higher than those before surgery ( $32.35\pm11.48$  vs.  $27.38\pm11.74$ , P<0.001). Attitude score in participants after surgery (possible range: 0~36) was also significantly higher than in those before surgery ( $27.77\pm3.505$  vs.  $26.6\pm3.267$ , P<0.001). According to the knowledge and attitude scores, participants evaluated before surgery had insufficient knowledge but positive attitudes toward the procedure, and those evaluated postoperatively had sufficient knowledge and positive attitudes (**Table 1 and Figure 1**).

In participants before surgery, the top three in terms of accuracy rate for the questions under knowledge dimension were K15, K4, and K3, with the accuracy rates of 79.88%, 79.27%, and 78.66%, respectively, whereas K12 (29.27%), K13 (40.24%), and K6 (40.85%) were ranked the last three in the accuracy. In participants after surgery, except for K2, K3, K4, and K12 (P > 0.05), the accuracy rates of other questions under knowledge dimension were significantly higher compared with those surveyed before surgery (P < 0.05). Specifically, the three questions under knowledge dimension with the highest accuracy rates were K15 (88.25%), K4 (83.45%), and K2 (78.90%). And the three questions with the lowest accuracy rates were still K12, K13, and K6, with the accuracy of 37.89%, 57.31%, and 58.99%, respectively (**Table S1**). Regarding the distribution of attitude dimension, scores found in A1, A4, A5, A6, A8, and A9 in patients after surgery were significantly higher than in those surveyed before surgery (P < 0.05). For A2, A3, A4, A5, A6, and A8, more participants

responded "highly positive" and "positive", while less people responded "negative" and "highly negative" (Table S2).

For the knowledge and attitude domains, the two-factor model demonstrated on **Figure S1** was tested by validation factor analysis. Satisfactory model fitness was demonstrated (**Table S3**) and final model demonstrated a strong relationship between items and attitude, as well as knowledge domain, with the composite reliability for all factors except K2, K4, K10 and K12 above the cut-off value of 0.7, as summarized in **Table S4**.

Additionally, in analysis of multivariate linear regression results, the knowledge scores were related to education level (Ref. senior middle school or lower; junior college/college, OR=5.81, 95% CI: 2.52-9.09, P=0.001; postgraduate or higher, OR=7.83, 95% CI: 3.83-11.8, P<0.001) and time of participants being surveyed (Ref. before refractive error surgery; after refractive error surgery, OR=5.09, 95% CI: 3.02-7.16, P<0.001) (**Table 2**). Different from the knowledge scores, the influencing factors of attitude scores included knowledge scores OR=0.05, 95% CI: 0.03-0.07, P<0.001), sex (Ref. male; female, OR=1.24, 95% CI: 2.52-9.09, P<0.001), age (Ref.  $\leq$ 20 years old; 21-30 years old, OR=-1.9, 95% CI: 2.52-9.09, P<0.001; >30 years old, OR=-2.5, 95% CI: -3.5--1.4, P<0.001), registered residence (Ref. agricultural household registration; non-agricultural household registration , OR=0.82, 95% CI: 0.22-1.42, P=0.007), monthly income (Ref.  $\leq$ RMB 5,000; RMB 5,000-10,000, OR=0.92, 95% CI: 0.06-1.78, P=0.036), and time of participants being surveyed (Ref. before refractive error surgery; after refractive error surgery, OR=0.86, 95% CI: 0.24-1.47, P=0.006) (**Table 3**).

# Table 2 Multivariate linear regression analysis for knowledge

Knowledge	Univariate analysi	S	Multivariate analysis		
	β (95%CI)	p-value	β (95%CI)	p-value	
			$R^2 = 0.0570*$		
			F= 12.68 (P<0.0	01)	
Sex					

Male	Ref**	-	Ref	-
Female	1.73(-0.36,3.83)	0.106		
Age (years)	· · · · · · · · · · · · · · · · · · ·			
<u>≤20</u>	Ref	-	Ref	-
21-30	0.03(-2.58,2.66)	0.978		
>30	-2.64(-5.84,0.54)	0.104		
Registered residence				
Agricultural household registration	Ref	-	Ref	-
Non-agricultural household registration	0.92(-1.0,2.85)	0.351		
Education level				
Senior middle school or lower	Ref	-	Ref	-
Junior college/college	5.80(2.45,9.14)	0.001	5.81(2.52,9.09)	0.001
Postgraduate or higher	7.42(3.34,11.4)	< 0.001	7.83(3.83,11.8)	< 0.00
Occupation, N (%)				
Government administrators of the country or leaders of enterprises and public institutions	Ref	-	Ref	_
Professionals (teachers, engineering technicians, writers, etc.)	1.99(-3.14,7.13)	0.445		
Clerks or relevant personnel	0.80(-5.34,6.96)	0.796		
Personnel in commercial business or service	0.79(-4.68,6.27)	0.776		
Personnel in farming, forestry, animal husbandry, fishery, etc.	0.41(-6.78,7.61)	0.91		
Operators of production or transportation equipment, or relevant personnel	- 0			
Army personnel	-5.41(-19.5,8.72)	0.452		
Housewife	0.13(-8.88,9.16)	0.976		
Personnel in medical and relevant industry	2.65(-3.81,9.13)	0.421		
Others	-1.05(-5.96,3.86)	0.674		
Monthly income per capita (Yuan)				
≤5000	Ref		Ref	-
5000-10000	1.09(-1.90,4.10)	0.473		
10000-20000	2.61(-0.50,5.72)	0.101		
≥20000	2.14(-1.40,5.69)	0.235		
Daily screen usage time (h)				
<4	Ref	-	Ref	-
4-6	-0.09(-2.98,2.79)	0.949		
>6	0.48(-2.15.3.13)	0.716		
Surveyed before or after refractive error surgery				
Before	Ref	-	Ref	-
After	4 97(2 88 7 06)	< 0.001	5 09(3 02 7 16)	<0.00

<sup>r</sup>Ket - Variable used as a reference in the analysis ·Adjusted K-squared;

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 Table 3 Multivariate linear regression analysis for attitude.

	Univariate analysis	6	Multivariate analysis		
Attitude	β (95%CI)	p-value	β (95%CI)	p-value	
	,	-	$R^2 = 0.1334*$	-	
			F= 5.70 ( <i>P</i> <0.001	)	
Knowledge	0.07(0.05.0.09)	< 0.001	0.05(0.03.0.07)	<0.001	
Sex					
Male	Ref**	-	Ref	-	
Female	0.93(0.31,1.55)	0.003	1.24(0.59,1.89)	< 0.001	
Age (years)					
<u>≤20</u>	Ref	-	Ref	-	
21-30	-1.33(-2.11,-0.56)	0.001	-1.9(-2.8,-1.0)	< 0.001	
>30	-1.53(-2.47,-0.59)	0.001	-2.5(-3.5,-1.4)	< 0.001	
Registered residence					
Agricultural household	Def		Def		
registration	Kei	-	Kei	-	
Non-agricultural household	0.06(0.20, 1.52)	0.001	0.92(0.22.1.42)	0.007	
registration	0.90(0.39,1.33)	0.001	0.82(0.22,1.42)	0.007	
Education level	6				
Senior middle school or lower	Ref	-	Ref	-	
Junior college/college	1.20(0.20,2.20)	0.018	0.99(-0.04,2.03)	0.061	
Postgraduate or higher	1.07(-0.14,2.28)	0.083	0.73(-0.57,2.05)	0.268	
Occupation, N (%)					
Government administrators of					
the country or leaders of	Ref	-	Ref	-	
enterprises and public institutions					
Professionals (teachers,					
engineering technicians, writers,	1.53(0.01,3.05)	0.047	1.21(-0.22,2.65)	0.098	
etc.)					
Clerks or relevant personnel	0.97(-0.84,2.79)	0.293	0.52(-1.20,2.24)	0.553	
Personnel in commercial	1.76(0.14.3.39)	0.033	1.45(-0.07.2.99)	0.063	
business or service			( , )		
Personnel in farming, forestry,					
animal nusbandry, fishery, etc.					
Operators of production or	0.90(1.22.2.02)	0.459	1.70(0.27.2.77)	0.100	
relevant personnal	0.80(-1.52,2.95)	0.438	1.70(-0.37,3.77)	0.108	
A may personnel	259(160676)	0.226	2 41(151625)	0.228	
Housewife	2.38(-1.00, 0.70)	0.220	2.41(-1.31,0.33)	0.220	
Porsonnal in madical and	1.4/(-1.19,4.14)	0.279	1.14(-1.40,3.08)	0.379	
relevant industry	2.02(0.11,3.94)	0.038	1.53(-0.28,3.35)	0.097	
Others	1 29(-0 15 2 75)	0.081	0.82(-0.58.2.22)	0.25	
Monthly income per capita (Vuan)	1.27(0.13,2.73)	0.001	0.02(0.00,2.22)	0.20	
<5000	Ref	_	Ref	_	
5000-10000	1 14(0 25 2 02)	0.011	0.92(0.06.1.78)	0.036	
10000-20000	0.89(-0.071.81)	0.011	0.52(0.00, 1.70)	0.050	
>2000	1.07(0.02,1.01)	0.037	0.32(-0.40, 1.44)	0.209	
$\geq 20000$	1.07(0.02,2.11)	0.045	0.82(-0.22,1.86)	0.122	

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Daily screen usage time (h)				
<4	Ref	-	Ref	-
4-6	-0.0(-0.8,0.82)	0.939		
>6	-0.1(-0.8,0.67)	0.79		
Surveyed before or after refractive				
error surgery				
Before	Ref	-	Ref	-
After	1.17(0.54,1.79)	< 0.001	0.86(0.24,1.47)	0.006

\*Adjusted R-squared; \*\*Ref - Variable used as a reference in the analysis

The comparison of sociodemographic characteristics between participants before and after surgery showed significant difference in age (P<0.001) and reasons for surgical correction of visual acuity (P=0.006) (**Table S5**). Moreover, lower knowledge scores were more likely to be found in those who were male (P=0.001), aged more than 30 years old (P=0.018), and had senior middle school or lower education level (P=0.014) in participants surveyed before surgery. In those surveyed after surgery, the participants with senior middle school or lower education level (P=0.017). Regarding attitude scores, the participants scored lower were male (P=0.006) in participants surveyed before surgery. In those surveyed after surgery, attitude scores differed by age (P=0.002) and registered residence (P=0.001) (**Table 4**).

Table 4	Knowledge	and	attitude	scores	surveyed	before	and	after	surgery	according	to
different	baseline char	acter	ristics.								

Variables Before Surgery Mean ± S	p-valu	After surgery	Davala	Before		After	
Variables surgery Mean ± S	p-valu	surgery	D				1
Mean ± S	e	Berg	P-valu	surgery	p-valu	surgery	P-valu
	D	Mean ± SD	e	Mean ± SD	e	Mean ± SD	e
Total same 27.38±11	.7	32.35±11.4		26.6±3.26		27.77±	
1 otal score 4		8		7		3.505	
Sex	0.001		0.616		< 0.001		0.052
Male 21.7±11.7	14	31.94±12.0 9		24.95±3.4 07		27.29± 3.687	
Female $\begin{array}{c} 29.03 \pm 11\\ 3 \end{array}$	.4	32.54±11.1 9		27.09±3.0 73		28.00± 3.398	
Age (years)	0.018		0.266		0.986		0.002
≤20 25.6±13.0	)9	32.50±11.9 52		26.67±3.7 92		28.95± 3.006	
21-30 28.65±11 5	.0	32.93±11.6 00		26.61±3.3 22		27.59± 3.364	
>30 21.23±13 4	.0	30.63±10.6 26		26.50±2.6 50		27.20± 4.059	
Registered residence	0.175		0.705		0.183		0.001
Agricultura l household registration 25.88±12 6	.3	32.11±11.8 04	4.	26.19±3.4 48		27.15± 3.672	
Non-agricultural28.41±11household36registration1000000000000000000000000000000000000	.2	32.54±11.2 46	6	26.89±3.1 22		28.25± 3.303	
Education level	0.014		0.017		0.474		0.100
Senior middle school or lower 20.14±10 67	.5	27.39±11.1 71		25.64±3.3 19		26.63± 2.604	
Junior college/colleg e 27.32±11 48	.9	32.71±11.6 39		26.64±3.2 48		27.92± 3.596	
Postgraduat 31.25±9.7 e or higher 6	76	33.73±9.85 4		26.93±3.3 55		27.71± 3.397	
Monthly income per capita (Yuan)	0.321		0.504		0.179		0.126
≤5000 23.35±11 97	.1	31.02±11.6 72		25.47±3.3 75		26.84± 3.893	
5000-1000 26.59±11 0 94	.4	31.94±11.6 29		26.88±3.1 4		28.00± 3.270	
10000-200 28.80±12 00 81	.2	33.54±11.2 10		26.27±3.3 36		28.01±3.5 37	
≥20000 28.83±11 12	.2	32.48±11.4 43		27.50±3.2 17		27.66± 3.570	

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Daily screen								
usage time (h)		0.645		0.827		0.717		0.955
<4	25.23±10.9		32.23±11.5		26.18±2.5		27.88±	
	59		48		00		3.354	
4-6	27.47±11.4		31.88±10.2		26.86±3.5		27.72±	
	58		81		36		3.687	
>6	27.84±12.1		32.67±12.1		26.57±3.2		27.77±	
	17		26		98		3.468	
Reasons for								
surgical								
correction of								
visual acuity								
Remove								
the glasses	29.60±11.5	0.085#	33.56±	0.056	27.53±2.9	0.010#	27.97±	0 308#
and improve	54	0.000	10.251	0.000	56	0.010	3.383	0.200
appearance								
Study in								
higher			20.02				0.7.01	
schools, job	$20.20\pm11.7$	0.003#	30.93±	0.142	25.00±3.8	0.019#	27.81±	0.901#
selection, or	3/		12.667		66		3.636	
joining the								
Inconvonio								
nce in putting	$2750\pm117$		22 58+10 4		26 12+2 0		27.80+	
up and off the	$27.30\pm11.7$	0.837#	55.56±10.4	0.004	$20.42\pm 5.0$	0.271#	$27.09\pm$ 3.312	0.334#
olasses	1.01		50		75		5.512	
others			24.07+				26.43+	
	-	-	13.697	0.006	-	-	5.515	0.144#

<sup>#</sup>Comparison of participants' score between those who chose the option and did not.

#### Discussion

This study suggested that myope or their guardians had positive attitudes toward corrective surgery both before and after the procedure. The presence of insufficient knowledge among patients prior to refractive surgery underscores the critical need for targeted educational interventions to enhance understanding and informed decision-making before undergoing the procedure. Vulnerable groups were identified who would benefit from targeted education, including male myopes, older patients and those with lower education levels. These findings may provide inspiration and direction for ophthalmic education before the refractive surgery. In the present study, the majority of participants were females aged less than 30, which was consistent with the epidemiology of myopia reported in previous studies[23-25]. In addition,

patients with higher educational level and longer daily screen usage time expressed strong

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desire for correction, in line with the previous study by Mirshahi *et al.* [26] discussing that people with higher educational achievements have higher prevalence of myopia and higher correction rate. At the same time in this study, individuals with lower levels of education were found to have less knowledge about refractive correction options. This highlights the presence of a smaller but more vulnerable subgroup within the population that is at greater risk of being under informed; moreover, they might be more susceptible to becoming victims of disinformation, as the Internet remains a primary source of information about myopia and its correction[11, 27]. These findings emphasize the critical need for targeted educational interventions tailored to address the specific needs of individuals with lower educational attainment, ensuring they are adequately informed about available corrective procedures and their implications.

A previous study among female students showed that the respondents had a high level of knowledge and awareness of refractive correction methods, especially refractive surgery [9]. Contrary to this result, the knowledge score and accuracy rates for questions under knowledge dimension in our study were low before surgery. After surgery, the knowledge scores of the participants were significantly improved, which may be attributed to the preoperative conversation with the surgeon explaining the knowledge of refractive surgery – however, with the unknown source it is difficult to assess whether or not participants had enough knowledge to make an informed decision at the time of surgery. Interesting to note that our findings showed a good fit for the questionnaire, supporting the construct validity, but demonstrated lower composite reliability for K2, K4, K10 and K12 – while 3 of those items also did not differ before and after operation, suggesting that some gaps in knowledge might still be present even after surgery. It is concerning that, according to numerous surveys [3, 28, 29], female participants often choose to undergo refractive surgery primarily for aesthetic reasons, such as enhancing their appearance, rather than based on sufficient

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> knowledge about the procedure. This lack of informed decision-making may place patients at a higher risk of encountering unnecessary complications or adverse outcomes associated with the surgery. Notably, the three questions under knowledge dimension with the lowest accuracy rates before and after surgery were K12, K13, and K6, which were related to indications and complications of refractive surgery. This might be linked to the fact suggested by previous cross-sectional study that patients were prone to refusing refractive surgery because of the fear of the surgical complications [30]. Without a comprehensive understanding of the potential benefits, risks, and limitations of the procedure, patients may be less prepared to make fully informed choices, which could compromise their overall safety and satisfaction with the surgical outcomes. Consequently, targeted education on the indications and complications of refractive surgery should be implemented.

> In addition, this study found that the participants had continued positive attitudes toward refractive surgery both those who only planned procedure and those who already underwent it, in line with previous reports on high level of satisfaction and positive attitude about vision correction surgery [31, 32]. Of note, lower attitude scores were more likely to be observed in the participants who aged >30 years and had agricultural household registration. This may be at least partly attributed to the efficacy of refractive surgery for myopia associated with younger age and low myopia [33]. Patients with agricultural household registration are usually older and have higher myopia, thus the outcome of refractive surgery may be impaired. It is also worth noting that attitude scores were strongly influenced by knowledge scores, suggesting that enhancing education about myopia and refractive surgery might contribute to the development of positive attitudes. As many previous studies demonstrated that the refractive surgeries achieved favorable visual outcomes in the correction of myopia [34-36], with adequate education and the empowerment of their attitudes, individuals with myopia would be better equipped to make informed decisions regarding refractive surgery,

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gaining a clearer understanding of its efficacy, as well as its potential advantages and disadvantages. Additionally, while the present survey was not explicitly designed as an educational intervention, we believe that the process of answering the questionnaire can itself stimulate reflection and awareness. By engaging with the questions, participants are exposed to information or concepts they may not have previously considered, which could prompt them to think more deeply about their condition, as was demonstrated before [37]. This inherent potential to influence awareness and attitudes, even if minimally, supports the idea that completing such questionnaire could be recommended as a potential educational intervention.

There are some limitations in the present study. First, the setting of the trial was in eastern province with relatively developed economy and society, limiting the wider generalizability of the results of our study. Second, due to using a self-designed questionnaire, bias and overestimation of real results may be introduced by responder and some variables related to knowledge and attitude scores may be neglected. Although additional validation factor analysis was conducted to assess the factorial structure of the questionnaire and results demonstrating good validity and reliability, using a convenience sample for both questionnaire validation and measuring results may introduce additional bias, potentially affecting the reliability of the validation process and the generalizability of the findings. Thirdly, as a result of cross-sectional design characteristics, the relationship between knowledge and attitude toward different variables was not specifically determined. Finally, the difference in numbers and the consist of individuals between the preoperative and postoperative groups (there are significant differences in their ages and reasons for surgical correction of visual acuity) could introduce some bias, and a larger preoperative sample size would improve the robustness of future analyses, furthermore, in the future, we will design to keep the preoperative and postoperative groups the same population for investigation.

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## Conclusion

 To summarize, myope or their guardians showed positive attitudes towards corrective surgery both before and after surgery. The presence of insufficient knowledge among patients prior to refractive surgery underscores the critical need for targeted educational interventions to enhance understanding and informed decision-making before undergoing the procedure. Empowering attitude and addressing some of the beliefs and concerns of patients with myopia or their guardians may further encourage patients to seek medical help.

#### List of abbreviations

Knowledge, attitudes, and practices KAP

Standard deviation SD

#### Declarations

#### Ethics approval and consent to participate

All procedures were performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This study was approved by the Ethics Committee of The First Affiliated Hospital of Soochow University [No.321 (2023)]. All methods were carried out in accordance with relevant guidelines and regulations.

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#### **Consent for publication**

Informed consents were obtained from all the participants.

#### Availability of data and materials

All data generated or analysed during this study are included in this published article [and its supplementary information files].

## **Competing interests**
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Authors' contributions

(I) Conception and design: YF Q

(II) Administrative support: YF Q

(III) Provision of study materials or patients: YF Q

(IV) Collection and assembly of data: All authors

(V) Data analysis and interpretation: All authors

(VI) Manuscript writing: All authors

Tez oni (VII) Final approval of manuscript: All authors

(VIII)YF Q is the guarantor.

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# **Figure Legends**

Figure 1 Comparison of knowledge (A), attitude (B) scores between evaluated before and after surgery

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Figure 1 Comparison of knowledge (A), attitude (B) scores between evaluated before and after surgery.

170x56mm (600 x 600 DPI)



**Figure S1** Two-factor model demonstrating the relationship between items and their respective factors according to the validation factor analysis.

Table S1 Knowledge dimension				9212 nclu	
Knowledge	Before surger	ry	After surg	$\frac{\text{gery}_{\underline{n}}^{\underline{0}}}{\text{mod}} = \frac{1}{2} \frac$	— p-value
K1	<u>Accuracy rat</u> 93	56 71	315	<b>9</b> 7 <b>9</b> 54	<0.001
K2	120	73.17	329		0.138
K3	129	78.66	327		0.949
K4	130	79.27	348		0.234
K5	85	51.83	277	are 65.43	0.001
K6	67	40.85	246	<b>5 958</b> .99	< 0.001
K7	83	50.61	282	<b>6 6</b>	< 0.001
K8	107	65.24	314	¥ 570.30	0.015
К9	96	58.54	303	an er: 22.66	0.001
K10	86	52.44	278	a 466.67	0.001
K11	94	57.32	276	້ <b>ລັ ⊋</b> @ ີ5.19	0.045
K12	48	29.27	158	<b>E</b> . <b>B B Z</b> .89	0.055
K13	66	40.24	239	n. <u></u> .31	< 0.001
K14	108	65.85	310	<b>@</b> · 7 <b>#</b> .34	0.040
K15	131	79.88	368	<b>≜</b> 88.25	0.009
				mj.com/ on June 7, 2025 at Agence Bibliog , and similar technologies.	

Table S2 Attitude dimension         Neutral (2 points)         Negative (1 pgntg         Highly negative (0 point)           Attitude         Highly positive (4 points)         Positive (3 points)         Neutral (2 points)         Negative (1 pgntg)         Highly point)         (before/after points)         Highly point)         (before/after points)         Highly point)         (before/after points)         Neutral (2 points)         Negative (1 pgntg)         Highly point)         (before/after points)         Highly	Table S2 Attitude dimension           Attitude         Highly positive (4 points)         Positive (3 points)         Neutral (2 points)         Negative (1 points)         Highly negative (0 points)         Positive (3 points)         Neutral (2 points)         Negative (1 points)         Highly negative (0 points)         Positive (3 points)         Neutral (2 points)         Neutral (2 points)         Negative (1 points)         Highly negative (0 points)         Positive (3 points)         Neutral (2 points)         Neutral (2 points)         Neutral (2 points)         Negative (1 points)         Highly negative (0 points)         Positive (3 points)         Neutral (2 points)         Neutral (2 points)         Neurral (2 points) <tht< th=""><th></th><th></th><th></th><th></th><th></th><th>BMJ Oper</th><th>I</th><th></th><th>omjopen by cop</th><th></th><th></th><th></th></tht<>						BMJ Oper	I		omjopen by cop			
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Attitude         %         (before/after surgery)         %         %         %	Attitude         %         (before/after surgery)         %         %         %     <	1401C 02 11tt	Highly posit	ive (4 points)	Positive (.	3 points)	Neutral (2	c points)	Negativ	re (1 pæint)e	Highly	negative (0	
A1 0.61 2.88 14.63 36.21 65.24 53.96 16.46 5.04# 50.00 0.24 A2 40.85 52.76 53.05 42.45 6.10 4.32 0.00 0.246 50.00 0.00 0.24 00 A3 45.73 55.88 50.61 40.05 3.05 3.84 0.61 0.246 50.00 0.00 0.00 0.04 A4 35.37 49.88 53.66 44.60 9.76 5.04 1.22 0.246 50 0.00 0.00 0.24 00 A5 32.93 55.88 60.37 41.49 6.71 2.40 0.00 0.246 500 0.00 0.00 0.24 A6 32.93 48.92 55.49 44.12 11.59 6.24 0.00 0.726 500 0.00 0.00 0.00 A7 2.44 3.12 16.46 11.51 40.85 37.89 31.71 35.00 0.00 0.00 0.24 < A8 79.27 56.59 10.37 34.53 9.76 6.24 0.61 2.446 0.00 0.244 < A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.966 0.00 0.24 < A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.966 0.00 0.48 <	A1 0.61 2.88 14.63 36.21 65.24 53.96 16.46 5.04 ref A2 40.85 52.76 53.05 42.45 6.10 4.32 0.00 0.24 0 0.00 0.24 A3 45.73 55.88 50.61 40.05 3.05 3.84 0.61 0.246 ref A4 35.37 49.88 53.66 44.60 9.76 5.04 1.22 0.246 ref A5 32.93 55.88 60.37 41.49 6.71 2.40 0.00 0.24 ref A6 32.93 48.92 55.49 44.12 11.59 6.24 0.00 0.724 ref A7 2.44 3.12 16.46 11.51 40.85 37.89 31.71 35.02 ref A8 79.27 56.59 10.37 34.53 9.76 6.24 0.061 2.402 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A1 ref A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.946 ref A1 ref A	Attitude	% (before/af	fter surgery)	%	(before/after	%	(before/after	%	(before/after	%	(before/after	e e
A2       40.85       52.76       53.05       42.45       6.10       4.32       10.00       0.24 register       0.00       0.24       0         A3       45.73       55.88       50.61       40.05       3.05       3.84       0.61       0.24 register       0.00       0.24 register       0.00 <td>A2       40.85       52.76       53.05       42.45       6.10       4.32       0.00       0.24       0.00</td> <td>A1</td> <td>0.61</td> <td>2.88</td> <td>14.63</td> <td>36.21</td> <td>65 24</td> <td>53.96</td> <td><u>16 46</u></td> <td>5 ()48 S III ar</td> <td>3.05</td> <td>1 92</td> <td>&lt;(</td>	A2       40.85       52.76       53.05       42.45       6.10       4.32       0.00       0.24       0.00	A1	0.61	2.88	14.63	36.21	65 24	53.96	<u>16 46</u>	5 ()48 S III ar	3.05	1 92	<(
A3       45.73       55.88       50.61       40.05       3.05       3.84       0.61       0.246 per to 50       0.00       0.00       0.00         A4       35.37       49.88       53.66       44.60       9.76       5.04       1.22       0.246 per to 50       0.00       0.00       0.24       0.00         A5       32.93       55.88       60.37       41.49       6.71       2.40       0.00       0.246 per to 50       0.00       0.00       <	A3 45.73 55.88 50.61 40.05 3.05 3.84 0.61 0.246 50 0.00 0.00 0.04 44 35.37 49.88 53.66 44.60 9.76 5.04 1.22 0.246 50 0.00 0.00 0.24 0.45 32.93 55.88 60.37 41.49 6.71 2.40 0.00 0.24 50 0.00 0.00 0.00 47 2.44 3.12 16.46 11.51 40.85 37.89 31.71 35.00 50 0.00 0.00 0.24 448 79.27 56.59 10.37 34.53 9.76 6.24 0.61 2.40 57 0.00 0.00 0.24 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.96 70 0.00 0.48 449 140 140 140 140 140 140 140 140 140 140	A2	40.85	52.76	53.05	42.45	6.10	4.32	0.00	0.24 <sup>e</sup> .e.h	0.00	0.24	0.
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A6       32.93       48.92       55.49       44.12       11.59       6.24       0.00       0.72 E Final       0.00       0.00       0.00       0.00         A7       2.44       3.12       16.46       11.51       40.85       37.89       31.71       35.00       8.54       12.47       0         A8       79.27       56.59       10.37       34.53       9.76       6.24       0.61       2.400       57       0.00       0.24       <	A6 32.93 48.92 55.49 44.12 11.59 6.24 0.00 0.724 100 8.54 12.47 (0.47) A7 2.44 3.12 16.46 11.51 40.85 37.89 31.71 35.00 8.54 12.47 (0.48) A8 79.27 56.59 10.37 34.53 9.76 6.24 0.61 2.400 0.00 0.24 < A9 13.41 24.22 53.66 58.51 31.71 15.83 1.22 0.996 0.00 0.48 <	A5	32.93	55.88	60.37	41.49	6.71	2.40	0.00	0.24 <b>6 6</b>	0.00	0.00	<(
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Table S3 A good model fit for the construct, indicated by: standardized root mean residual (	SRMR); root
mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker	Lewis Index
(TLI).	

Indicators	Reference	Results	
RMSEA	<0.08 Good	0.061	
SRMR	<0.08 Good	0.068	
TLI	>0.8 Good	0.872	
CFI	>0.8 Good	0.884	

Table S4 Res	sults of validation factor analysis		
	Es	stimate P> z	
K1	Knowledge	1	
K2	Knowledge	0.40	< 0.001
K3	Knowledge	0.75	< 0.001
K4	Knowledge	0.63	< 0.001
K5	Knowledge	1.08	< 0.001
K6	Knowledge	1.23	< 0.001
K7	Knowledge	0.91	< 0.001
K8	Knowledge	1.08	< 0.001
K9	Knowledge	1.00	< 0.001
K10	Knowledge	0.69	< 0.001
K11	Knowledge	1.19	< 0.001
K12	Knowledge	0.51	< 0.001
K13	Knowledge	1.25	< 0.001
K14	Knowledge	1.11	< 0.001
K15	Knowledge	0.73	< 0.001
A1	Attitude	1	
A2	Attitude	2.37	< 0.001
A3	Attitude	2.38	< 0.001
A4	Attitude	2.72	< 0.001
A5	Attitude	2.35	< 0.001
A6	Attitude	2.30	< 0.001
A7	Attitude	-0.93	< 0.001
A8	Attitude	0.99	< 0.001
A9	Attitude	1.75	< 0.001

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Variables		Before surgery, N (%)		After surgery, N (%)	
Sex					0.029
Male	37	22.56	134	32.13	
Female	127	77.44	283	67.87	
Age (years)					< 0.001
≤20	15	9.15	82	19.66	
21-30	127	77.44	245	58.75	
>30	22	13.41	90	21.58	
Registered residence					0.679
Agriculture account	67	40.85	180	43.17	
Non-agriculture account	97	59.15	237	56.83	
Education level					0.350
Senior middle school or lower	14	8.54	38	9.11	
Junior college/college	122	74.39	327	78.42	
Postgraduate or higher	28	17.07	52	12.47	
Monthly income per capita (Yuan)					0.268
≤5000	17	10.37	62	14.87	
5000-10000	64	39.02	168	40.29	
10000-20000	59	35.98	120	28.78	
>20000	24	14.63	67	16.07	
Daily screen usage time (h)					0.236
<4	22	13.41	80	19.18	
4-6	49	29.88	123	29.50	
>6	93	56.71	214	51.32	
Reasons for surgical correction of visual acuity					0.006
Remove the glasses and improve appearance	55	33.54	183	43.88	
Study in higher schools, job selection, or joining the army	20	12.20	106	25.42	
Inconvenience in putting up and off the glasses	116	70.73	278	66.67	
others		-	14	3.36	

Table S5 The comparison of sociodemographic characteristics between participants before and after

Page 37 of 41	BMJ Open Gg Be
1	yright
2 3	Appendix <sup>in 0</sup> 921
4 5 6	Dear patient,
7 8 0	We are investigators from the Ophthalmology Department of First Affiliated Hospital of Soocho
10 11	designed by us to investigate the awareness of individuals underwent refractive surgery in out hospital and be guardians on surgeries for refractive
12 13 14	errors (myopia). The data collected by this questionnaire are confidential, and your information will not a solution of the so
15 16 17	it. The data provided by you will only be used for the survey, which could help providing evidence for the scientific interventional $\mathbf{x} = \frac{1}{2}$
17 18 19	strategies. To guarantee the validity of this survey, please answer the questions according to your own and the strategies. The survey is the strategies are supplied to the survey of the survey of the survey is t
20 21 22 23	making time to participate in this survey, and we appreciate your support and cooperation in this study very much!
24 25 26	ig, and s
27 28	imilar te
29 30 31	$\Box$ I aware and consent that the data collected in this survey will be used for the scientific study.
32 33 34	Signature:
35 36	gen ce E
37 38 39	
40 41	
42 43 44	For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

The First Part: Basic information       Your sex:     a. Male       b. Female     Standard       Your age (years):     a. <20       b. 21-30     Base of the standard       c. 41-50     Control of the standard       d. >50     Over standard       Who is receiving the refractive surgery:     a. Myself       d. >50     Over standard       Base of the standard     Standard       Cocupation:     a. Government administrators of the standard <th></th> <th>BMJ Open by n. cop gg en</th>		BMJ Open by n. cop gg en
The First Part: Basic information       Image: Comparison of the second se		vright,
Your sex:       a. Male       b. Female       or         Your age (years):       a. <20       sementation of the second of t	The	e First Part: Basic information
b. Female       The second secon	1. Your sex:	a. Male
Your age (years):       a. <20		b. Female <b>q x</b>
b. 21-30 b. 31-40 c. 41-50 d50 Who is receiving the refractive surgery: a. Myself Registered residence: a. Agriculture b. My child Educational level: a. Junior middle school or lower b. Senior middle school vechnikation c. Junior college/college d. Postgraduate or higher d. Postgraduate or higher a. Government administrators of the country or leaders of enterpris and public institutions b. Professionals (teachers, engingereiging technicians, and writers, etc.) c. Clerks or relevant personnel d. Personnel in commercial business, or service e. Personnel in commercial business, or service g. Army personnel h. Housewife i. Personnel in medical and relevant personnel g. Army personnel h. Housewife i. Personnel in medical and relevant personnel in medical and relevant person in medica	2. Your age (years):	a. <20
b. 31-40 c. 41-50 d. >50 Who is receiving the refractive surgery: b. My self egistered residence: a. Agriculture b. Non-agriculture a. Junior middle school or lows b. Senior middle school / techniquel c. Junior college/college d. Postgraduate or higher Occupation: a. Government administrators of the country or leaders of enterprise and public institutions b. Professionals (teachers, engineering technicians, and writers, etc.) c. Clerks or relevant personnel d. Personnel in commercial businese g. Army personnel g. Army personnel h. Housewife i. Personnel in medical and relevant for peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml		b. 21-30
c. 41-50 d. >50 Who is receiving the refractive surgery: b. My self Registered residence: c. 4. Agriculture b. Non-agriculture b. Non-agriculture ducational level: c. Junior middle school or lower b. Senior middle school rother b. Senior middle school rother b. Senior middle school rother c. Junior college/college d. Postgraduate or higher country or leaders of enterprise and public institutions b. Professionals (teachers, engineering technicians, and writers, etc.) c. Clerks or relevant personnel d. Personnel in farming, forestrice g. Army personnel d. Housewife i. Personnel in medical and relevan g. Army personnel d. Housewife i. Personnel in medical and relevan Enduction equipment, or relevan personnel f. Personnel in medical and relevan Enduction equipment, or relevan f. Personnel in medical and relevan Enduction equipment, or relevan f. Personnel in medical and relevan Enduction equipment, or relevan f. Personnel in medical and relevan f. Personnel f. Personnel f. Housewife f. Personnel in medical and relevan f. Personnel f.		b. 31-40
d. >50       growth         Who is receiving the refractive surgery:       a. Myself         b. My child       d. Agriculture         Registered residence:       a. Agriculture         Educational level:       a. Junior middle school or lower         Educational level:       b. Senior middle school / technietti scoondary school         c. Junior college/college       d. Postgraduate or higher         d. Occupation:       a. Government administrators of the country or leaders of enterprise and public institutions         b. Professionals (teachers, engineering technicians, and writers, etc.)       c. Clerks or relevant personnel         d. Personnel in commercial busines, or service       e. Personnel in commercial busines, or service         e. Personnel in medical and relevantion equipment, or relevant personnel       growth         g. Army personnel       h. Housewife         i. Personnel in medical and relevantion equipment, or relevant personnel       growth         j. Others       growth		c. 41-50
Who is receiving the refractive surgery:       a. Myself       Image: Constraint of the second secon		d. >50
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b. Non-agriculture       b. Son-agriculture         Educational level:       a. Junior middle school or lowe         b. Senior middle school/ technical       secondary school         c. Junior college/college       d. Postgraduate or higher         d. Postgraduate or higher       e         Occupation:       a. Government administrators of the country or leaders of enterpris and public institutions         b. Professionals (teachers, engineering technicians, and writers, etc.)       c. Clerks or relevant personnel         d. Personnel in commercial businees or service       e. Personnel in farming, forestrog a simal husbandry, or fishery, etc.         f. Operators of production or grading portation equipment, or relevan personnel       g. Army personnel         g. Army personnel       h. Housewife         i. Personnel in medical and relevant industry       j. Others	4. Registered residence:	a. Agriculture
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d. Postgraduate or higher       j         Occupation:       a. Government administrators       ft the country or leaders of enterpris and public institutions         b. Professionals (teachers, engineering technicians, and writers, etc.)       c. Clerks or relevant personnel       j         c. Clerks or relevant personnel       j       j         d. Personnel in commercial business       or service         e. Personnel in farming, forestrig       agimal husbandry, or fishery, etc.         f. Operators of production or grant       grant         g. Army personnel       j         h. Housewife       i         i. Personnel in medical and relevant       j         others       j		c. Junior college/college
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1 2		v-2024-0 yright, i	
3 4 5 6 7 8 9	7. The monthly income of your family per capita in the past year (including physical income and rental income): Yuan.	n     92       a.<2000     Cluding on 27       b.2000-5000     on 27       c.5000-10000     for 27       d.10000-20000     uses ref.       e.>20000     ref.	
10	8. The degree of myopia before surgery (Please report the degree of you	r child if you are a parent): Left	ee; Right:degree.
11 12 13 14	9. Daily time of screen usage, including the use of cellphone, iPad, computer, or television, etc. (Please report the time of your child if you are a parent):	a. <2 hd ment Sib. 2-4 hto text superiorc. 4-6 hand	
15		d. >6h	
17 18 19	10. Which are the reasons that you want to correct the visual acuity by refractive surgery?	a. Remove the glasses and improve the approximate approximately b. Study in higher schools, job approximately contact of the contact of the school of the contact of the school of the contact of the con	ppearance or joining the army e glasses
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	t, in	F-09
The Second Part: Knowledge on refractive (myopia) sur	gery 🗧	
K1. Refractive surgeries mainly include two types, i.e. corneal refractive surgery and implantable of	contage le	gs (ICL).
a. Right b. Wrong c. Unclear	for !	27
	use	
K2. All myopia patients aged $>18$ years wanting to remove the glasses can receive refractive surge	rv. eigi	n 5 V
a. Right b. Wrong c. Unclear	Inen	005
	d to	
	text	
K3. Laser surgery for myopia is a "subtraction surgery", while ICL is an "addition surgery".	peri tan	
a. Right b. Wrong c. Unclear	d eur	
K4. Patients need to stop wearing contact lenses before surgery. Generally, wearing of soft lenses	(reg <b>āla</b> r	contact lenses) should be stop
for 1 week, hard lenses such as RGP should be stopped for 1 month, and orthokeratology lenses sh	ould Berg	opped for more than 3 months
a. Right b. Wrong c. Unclear	ng,	5
K5. Range of diopters that can be corrected by excimer laser surgery: myopia less than 1200 deg	ree, 🏝 tig	matism less than 600 degree,
hyperopia less than 600 degree.	rain	
a. Right b. Wrong c. Unclear	ing,	
K6. For excimer laser surgery, the cornea need to by >450 nm, and the anticipated thickness of res	sidualecor	heal flap after the surgery is $>$
um (>280 um is recommended), and should be >50% of the thickness before surgery.	d sir	
a. Right b. Wrong c. Unclear	nila (	
K7. For patients with relatively thin cornea, high degree of myopia, with no other contraindicati	ons, and	neet the requirements of surg
parameters, semi-femtosecond laser surgery could be selected.	;hnc	P 7
a. Right b. Wrong c. Unclear		202 202
K8. Full femtosecond laser surgery is not suitable for patients with astigmatism >50 degrees	and <b>g</b> orn	eal thickness below the requi
parameters, or myopia >1000 degrees.		P
a. Right b. Wrong c. Unclear		
K9. Full femtosecond laser surgery is suitable for myope of 100-1000 degrees and astigmatism $<50$	)0 degree	
a. Right b. Wrong c. Unclear		5 
K10. Full femtosecond laser surgery is suitable for patients loving strenuous exercises, fighting and	l boxing,	and competitive sports, or spec
	5	
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1 2	
3 4 5	individuals.     2     2       a. Right     b. Wrong     c. Unclear
6 7 8 9 10	K11. ICL surgery has the characteristic of reversible and is suitable for correcting myopia with or without astigmatism. ICL surgery is the preferred method for correcting high-grade myopia >1000 degrees. Patients with moderate- or low-degrees by opia that meeting the indications could select the method according to their own conditions.
11 12 13 14 15 16	K12. The follows are complications of risks after refractive surgery: 1) xerophthalmia; 2) corneal subeptities and haze; 3) infection; 4) refractive regression, and become myopia again; 5) difficult in reading; 6) residual diopters after surgery; 7) dry exceeds 8) dazzling; and 9) reduced night vision, and difficult in driving in the night. How many of them do you know? a. $\geq 7$ ; b.5-7; c.1-4; d. none at all
17 18 19 20 21 22 23	K13. For superficial excimer laser surgery (such as LASEK or TPRK, etc.), the degree of correction should be no higher than 800 degrees. The surgery is more suitable for several specific conditions, such as patients with corneal scars and opacities, for epithelial basement membrane dystrophy. However, the discomfort in the eyes after surgery is substantial, the recovery cycle is relatively bing, and the patients have the risk of corneal stroma opacity.
24 25 26 27 28	K14. The range of diopters that can be corrected by semi-femtosecond laser surgery is large, during the process femtosecond laser is required to make the flaps, and the postoperative risk of corneal complications is higher than other correction methods. Impact by accident or trauma of the eyes after surgery could potentially damage the cornea, and emergent treatment is needed for severe tasses. a. Right b. Wrong c. Unclear
29 30 31 32 33	K15. Full femtosecond SMILE surgery involves minimally invasive injury (the smallest is 2 cm), the process of surgery is fast, the effective capsulorhexis area is large, and the cornea is safe and stable after surgery.         a. Right b. Wrong       c. Unclear
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41 42 43 44 45	For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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The Third Deut Attitude on refugative (myonic) surgery	t, incl	4-092
The Thru Part Attitude on refractive (myopia) surgery		T <u>2</u>
A1. 1 our awareness on refractive surgery.	ng fi	
a. Highly unaware; b. Unaware; c. Fair; d. Aware; e. Highly aware	or u	27
A2. Are you satisfied to the preoperative examination processes?	Ens	larc
a. Highly satisfied; b. Satisfied; c. Fair; d. Unsatisfied; e. Highly unsatisfied	reigi	ד 20
A3. Are you satisfied to the explanations by the personnel from the hospital?	nem	025.
a. Highly satisfied; b. Satisfied; c. Fair; d. Unsatisfied; e. Highly unsatisfied	tont	D 9
A4. Do you agree that you have fully understood the detailed processes of this surgery before the surgery	ger <b>s</b> is	<b>v</b> nl
a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree	ano	o a
A5. Do you agree that you think you have selected the most suitable surgical type?	eur da	ed f
a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree		
A6. Do you agree that in your case, the advantages of the myopia correction surgery overwhelm the c	lisa	ntages?
a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree	ng,	
A7. Do you agree that advertisements could influence you in understanding the myopia correction su	rge <mark>∄</mark> es	
a. Highly agree; b. Agree; c. Fair; d. Disagree; e. Highly disagree	rain	o pe
A8. How do you think the effects of the myopia surgery?	ing,	л. Б
a. Highly effective, and the visual acuity recovered to normal level; b. Effective but not very substant	ntia <b>g</b> ;	Effective but with substantial side
effects; d. Effective, but refractive regression occurred; e. Not effective at all	d si	Ö
A9. Will you recommend the myopia correction surgery to your friends with myopia?	nila	on
a. Strongly recommend; b. Recommend; c. Fair; d. Not recommend; e. Highly not recommend	lfe	ר ה
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	gies	25 a
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