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ORIGINAL RESEARCH

Knowledge, Attitude, and Practice Toward Varicocele in Patients with Varicoceles: A Cross-Sectional Study in Chinese Patients

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Objective: To explore patients' knowledge, attitude, and practice (KAP) toward varicocele in China and the relationship between treatment selection and KAP.

Methods: This cross-sectional study enrolled varicocele patients at the Third Affiliated Hospital of Soochow University (September to October 2023). Structural equation modeling (SEM) was used to explore the relationship between clinical factors and KAP. A score >mean score for each dimension was defined as adequate knowledge, positive attitude, and proactive practice. The patients were grouped according to varicocelectomy vs no surgery. Univariable and multivariable logistic regression analyses were used to identify the factors independently associated with KAP. A structural equation modeling (SEM) analysis was performed to examine how the KAP dimensions influenced each other.

Results: Among 502 patients, 44.02%, 35.86%, and 20.12% were ≤30, 31–40, and >40 years old, respectively. Those who underwent varicocelectomy (n=407) had significantly higher knowledge (20 (15–22) vs 0 (0–6), P<0.001), attitude (26 (24–26) vs 14 (10–18), P<0.001), and practice (20 (17–24) vs 8 (6–16), P<0.001) than those who did not. A higher proportion of patients with varicocelectomy were <40 years old, more educated, had higher income, and were unmarried compared with those without surgery (all P<0.001). High school or higher education level and varicocelectomy (irrespective of type) were independently associated with adequate knowledge (all P<0.001). Knowledge, college/bachelor's degree education, and varicocelectomy type (irrespective of type) were associated with positive attitudes (all P<0.05). In the SEM, knowledge directly influenced attitude, knowledge directly influenced practice, and attitude directly influenced practice (all P<0.001). Having knowledge of the subject may direct varicocele patients to varicocelectomy.

Conclusion: Chinese patients who underwent varicocelectomy exhibit appropriate KAP regarding varicocele, while non-surgery patients have poorer KAP. These results suggest that patients who did not undergo surgery should nevertheless be properly informed about their disease.

Keywords: knowledge, attitude, practice, varicocele, varicocelectomy, cross-sectional study

Introduction

Varicocele is a vascular lesion characterized by the dilation of gonadal veins in the scrotum, sometimes described as having a "bag of worms" appearance, and is one of the most common causes of scrotal swelling.[1–3] Varicocele is considered the most common cause of male infertility that can be corrected.[3] The prevalence of varicocele in male adults is about 15% overall but may be up to 40% in males attending infertility clinics.[1,2,4] The etiology of varicocele includes primary varicocele due to dilation of the internal spermatic vein (gonadal vein) with venous

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blood reflux into the pampiniform plexus.[1–3] Varicocele repair may help reverse pathologic conditions, prevent additional damage to testicular function, improve spermatogenesis, and improve pregnancy rates.[1–3,5] Varicocelectomy techniques include conventional (open) surgery, laparoscopic surgery, and microsurgery (which is considered the gold standard).[2,3]

Still, varicocele is a benign condition that only possibly impacts fertility and the patient's quality of life, but it may have public health implications in terms of reproduction[1,3] and mental health[6,7] in the case of large varicocele. Even when diagnosed with the condition, there is no urgency in action. Therefore, understanding the knowledge, attitudes, and practices (KAP) of the patients towards their own disease can have an important impact on treatment outcomes and prognosis and is a public health issue. KAP studies provide quantitative and qualitative data about the knowledge gaps, misunderstandings, and misconceptions that represent barriers to adequately implementing a specific subject in a specific population.[8,9] Understanding the patients' KAP level toward varicocele could help improve patient management, clinical care, and treatment outcomes. KAP studies allow the identification of factors that can be used to design interventions.

The previous studies on the KAP toward varicocele are limited. A study reported poor knowledge and high rates of decisional conflicts among men with varicocele.[10] Another study reported very poor KAP toward benign testicular disorders (including varicocele) among educated young men in Pakistan.[11] A few studies reported alarmingly poor KAP levels toward testicular diseases[12–15] and testicle self-examination.[16–19] No previous studies examined the KAP of Chinese patients with varicocele.

Therefore, this study aimed to explore the KAP towards varicocele among Chinese patients with varicocele and the relationship between treatment selection and KAP. A structural equation modeling (SEM) analysis was used to examine how the KAP dimensions and surgery interacted with each other. The SEM hypotheses were 1) knowledge has a direct impact on attitude and practice, 2) attitude has a direct impact on practice, and 3) knowledge has an indirect impact on practice.

Materials and Methods

Study Design and Patients

This cross-sectional study included patients with varicocele between September to October 2023 in the Department of Urology of the Third Affiliated Hospital of Soochow University (the First People's Hospital of Changzhou). The inclusion criteria were 1) >18 years of age, 2) diagnosed with varicocele,[4] 3) candidate to varicocelectomy, and 4) voluntary participation. The exclusion criteria were 1) unable to read or communicate and 2) any cognitive impairment that could affect the participant's comprehension of the questions. The study was approved by the Medical Ethics Committee of the Third Affiliated Hospital of Soochow University (the First People's Hospital of Changzhou) (approval # (2023-K-164)), and informed consent was obtained from all patients.

Questionnaire

The questionnaire was designed based on the literature on varicoceles[3,20–22] and guidelines.[4,5] It was then revised by two senior andrology experts and was modified according to their comments. A pilot study revealed Cronbach's α of 0.853, indicating good internal consistency.

The final questionnaire consisted of four dimensions: basic information (12 items), knowledge dimension (11 items), attitude dimension (six items), and practice dimension (six items). In the knowledge dimension, "very known", "partly known", and "unclear" were scored 2, 1, and 0 points, respectively, with a total score of 0–22 points. The attitude dimension was scored using a 5-point Likert scale, with positive attitude questions scored from strongly agree (5 points) to strongly disagree (1 point), while the negative attitude question (item A3) was scored in reverse, with a total score of 6–30 points. The practice dimension was scored using a 5-point Likert scale, with "always" to "never" scored 5 to 1 point, respectively, with a total score of 6–30 points. A score >mean score for each dimension was defined as adequate knowledge, positive attitude, and proactive practice.

Questionnaire Distribution and Quality Control

The electronic questionnaire was created using an online platform (Sojump), and a QR code was generated for the electronic questionnaire. The questionnaires were administered through convenience sampling to patients visiting the hospital. The patients scanned the QR code sent via WeChat to log in and fill out the questionnaire. A given IP address could only be used once to submit a questionnaire. All items were mandatory. The questionnaires were completed anonymously. The research team members checked all questionnaires for completeness, internal consistency, and reasonableness. The questionnaires that took <60 s to complete, with logical errors, or where all the options selected were identical were considered invalid. Eight doctors and nurses responsible for promoting and distributing the questionnaires were trained for this study and acted as research assistants.

Sample Size

The formula

$$n = \left(\frac{Z_{1-\alpha/2}}{\delta}\right)^2 \times p \times (1-p)$$

can be used to calculate the sample size of cross-sectional surveys. In the formula, n represents the sample size for each group, α represents the type I error (which is typically set at 0.05), $Z_{1-\alpha/2}$=1.96, δ represents the allowable error (typically set at 0.05), and p is set at 0.5 (as setting it at 0.5 maximizes the value and ensures a sufficiently large sample size). Hence, the calculated sample size was 384. Considering an estimated questionnaire response rate of 80%, a minimum of 480 valid questionnaires were needed.

Statistical Analysis

SPSS 22.0 (IBM Corp., Armonk, NY, USA) was used for analysis. The continuous data were tested for normal distribution using the Kolmogorov–Smirnov test. The continuous data with a normal distribution were presented as means ± standard deviation (SD) and analyzed using Student's *t*-test (comparisons of two groups) or ANOVA (comparisons of three or more groups). The continuous data with a non-normal distribution were presented as medians (interquartile range) and analyzed using the Wilcoxon-Mann–Whitney test (comparisons of two groups) or the Kruskal–Wallis analysis of variance (comparisons of three or more groups). Multivariable regression was performed using adequate knowledge, positive attitude, and proactive practice as dependent variables to analyze the influencing factors of KAP. Variables with P<0.05 in the univariable analyses were included in the multivariable logistic regression analysis. A SEM analysis was performed to examine the interactions between KAP and surgery. Two-sided P-values <0.05 were considered statistically significant.

Results

Characteristics of the Patients

A total of 520 questionnaires were returned; four were excluded due to errors in logic, and 14 were excluded due to selecting the same option for all KAP questions. Hence, 502 valid questionnaires were included in the analysis. Table 1 presents the characteristics of the participants. Among 502 patients, 44.02%, 35.86%, and 20.12% were ≤30, 31–40, and >40 years old, respectively; 32.87% and 67.13% were living in rural and urban areas, respectively; 20.12%, 40.24%, and 39.64% had junior high school or below education, high school or vocational school education, and college/bachelor's degree or above education, respectively; 32.47%, 62.55%, and 4.98% were unmarried, married, and divorced/widowed, respectively.

Knowledge, Attitude, and Practice

In all patients, the knowledge, attitude, practice, and total scores were 18 (8–22), 26 (22–26), 19 (15–24), and 62 (49–68). Among the 502 participants, 323 (64.34%) had adequate knowledge, 332 (66.14%) had a positive attitude, and 254 (50.60%) had proactive practice. The patients who underwent surgery (n=407) had higher KAP scores than those who did

Table 1 Characteristics of the Patients

	n (%)	Surgery	No Surgery	P
n	502	407	95	
Age				<0.001
≤30 years	221 (44.02)	201 (49.39)	20 (21.05)	
31–40 years	180 (35.86)	151 (37.10)	29 (30.53)	
>40 years	101 (20.12)	55 (13.51)	46 (48.42)	
Body mass index				0.245
<18.5 kg/m^2 (underweight)	59 (11.75)	52 (12.78)	7 (7.37)	
18.5–23.9 kg/m^2 (normal)	280 (55.78)	229 (56.27)	51 (53.68)	
24–27.9 kg/m^2 (overweight)	120 (23.90)	91 (22.36)	29 (30.53)	
≥28 kg/m^2 (obese)	43 (8.57)	35 (8.60)	8 (8.42)	
Residence				0.205
Rural	165 (32.87)	139 (34.15)	26 (27.37)	
Urban	337 (67.13)	268 (65.85)	69 (72.63)	
Education				<0.001
Junior high school and below	101 (20.12)	66 (16.22)	35 (36.84)	
High school/vocational school	202 (40.24)	172 (42.26)	30 (31.58)	
College/bachelor's degree or above	199 (39.64)	169 (41.52)	30 (31.58)	
Occupation type				0.238
Long-term standing or walking job	244 (48.61)	203 (49.88)	41 (43.16)	
Non-long-term standing or walking job	258 (51.39)	204 (50.12)	54 (56.84)	
Average monthly family income, CNY				<0.001
<5000	39 (7.77)	23 (5.65)	16 (16.84)	
5000–10,000	233 (46.41)	184 (45.21)	49 (51.58)	
10,000–20,000	156 (31.08)	138 (33.91)	18 (18.95)	
>20,000	74 (14.74)	62 (15.23)	12 (12.63)	
Marital status				<0.001
Unmarried	163 (32.47)	141 (34.64)	22 (23.16)	
Married	314 (62.55)	254 (62.41)	60 (63.16)	
Divorced/widowed	25 (4.98)	12 (2.95)	13 (13.68)	
Duration of illness				0.186
<3 years	151 (30.08)	116 (28.50)	35 (36.84)	
3–5 years	94 (18.73)	75 (18.43)	19 (20.00)	
≥6 years	257 (51.20)	216 (53.07)	41 (43.16)	
Surgical method				
Laparoscopic surgery	202 (40.24)		–	
High ligation of the spermatic vein through the abdominal cavity	90 (17.93)		–	
Microscopic high ligation of spermatic vein	103 (20.52)		–	
Other (open high ligation of the spermatic vein through inguinal canal and spermatic vein interventional embolization)	12 (2.39)			
Wife conceive naturally after surgery				
Yes	116 (23.11)		–	
No	73 (14.54)		–	
No plan for childbirth	77 (15.34)		–	
Unmarried	141 (28.09)		–	
Knowledge	18 (8–22)	20 (15–22)	0 (0–6)	<0.001
Attitude	26 (22–26)	26 (24–26)	14 (10–18)	<0.001
Practice	19 (15–24)	20 (17–24)	8 (6–16)	<0.001
Total score of KAP	62 (49–68)	64 (58–69)	24 (17–40)	<0.001

Abbreviations: CNY, Chinese yuan; KAP, knowledge, attitude, and practice.

not (all P<0.001). The distribution of knowledge, attitude, and practice scores is shown in Supplementary Tables S1–S3. The patients without varicocelectomy had lower scores than those with varicocelectomy for all KAP items (all P<0.05).

Univariable and Multivariable Analysis of Knowledge

There were significant differences in knowledge scores with age, education, income, marital status, and surgery (Table 2). High school/vocational school (OR=10.895, 95% CI: 5.076–23.389, P<0.001), college/bachelor's degree or above (OR=27.899, 95% CI: 10.800–72.070, P<0.001), laparoscopic surgery (OR=43.623, 95% CI: 17.968–105.910,

Table 2 Univariable Analysis of Knowledge, Attitude, and Practice

	Knowledge		Attitude		Practice	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Knowledge score			1.159 (1.128 1.192)	<0.001	1.128 (1.097 1.159)	<0.001
Attitude score					1.229 (1.165 1.296)	<0.001
Age						
≤30 years	Ref.		Ref.		Ref.	
31–40 years	0.951 (0.610 1.484)	0.826	0.536 (0.340 0.846)	0.007	0.814 (0.546 1.215)	0.314
>40 years	0.143 (0.085 0.242)	<0.001	0.115 (0.068 0.197)	<0.001	0.138 (0.078 0.246)	<0.001
Body mass index						
<18.5 kg/m^2 (underweight)	0.877 (0.490 1.571)	0.660	0.771 (0.429 1.383)	0.383	0.786 (0.447 1.380)	0.401
18.5–23.9 kg/m^2 (normal)	Ref.		Ref.		Ref.	
24–27.9 kg/m^2 (overweight)	0.839 (0.539 1.307)	0.438	0.851 (0.542 1.338)	0.485	0.931 (0.607 1.428)	0.743
≥28 kg/m^2 (obese)	0.974 (0.496 1.911)	0.939	0.637 (0.330 1.227)	0.177	0.975 (0.513 1.854)	0.939
Residence						
Rural	Ref.		Ref.		Ref.	
Urban	1.271 (0.865 1.869)	0.222	0.890 (0.599 1.323)	0.564	1.094 (0.754 1.588)	0.637
Education						
Junior high school and below	Ref.		Ref.		Ref.	
High school/vocational school	8.109 (4.636 14.183)	<0.001	2.908 (1.776 4.764)	<0.001	3.563 (2.097 6.052)	<0.001
College/bachelor's degree or above	15.214 (8.433 27.448)	<0.001	4.243 (2.546 7.073)	<0.001	4.618 (2.708 7.874)	<0.001
Occupation type						
Long-term standing or walking job	0.731 (0.507 1.055)	0.094	0.826 (0.570 1.196)	0.311	0.716 (0.504 1.017)	0.062
Non-long-term standing or walking job	Ref.		Ref.		Ref.	
Average monthly family income, CNY						
<5000	Ref.		Ref.		Ref.	
5000–10,000	5.109 (2.319 11.255)	<0.001	2.550 (1.277 5.093)	0.008	3.842 (1.695 8.710)	0.001
10,000–20,000	11.111 (4.831 25.53)	<0.001	4.032 (1.941 8.374)	<0.001	4.761 (2.058 11.015)	<0.001
>20,000	8.413 (3.420 20.695)	<0.001	3.398 (1.512 7.635)	0.003	5.683 (2.299 14.052)	<0.001
Marital status						
Unmarried	Ref.		Ref.		Ref.	
Married	0.753 (0.500 1.132)	0.173	0.416 (0.267 0.649)	<0.001	0.547 (0.372 0.805)	0.002
Divorced/widowed	0.132 (0.050 0.350)	<0.001	0.099 (0.038 0.256)	<0.001	0.153 (0.055 0.430)	<0.001
Duration of illness						
<3 years	Ref.		Ref.		Ref.	
3–5 years	0.858 (0.504 1.458)	0.571	0.956 (0.540 1.693)	0.878	0.509 (0.298 0.871)	0.014
≥6 years	1.069 (0.702 1.629)	0.756	0.595 (0.385 0.920)	0.019	0.241 (0.156 0.372)	<0.001
Surgery						
No surgery	Ref.		Ref.		Ref.	
Laparoscopic surgery	36.402 (16.920 78.317)	<0.001	38.217 (16.608 87.941)	<0.001	3.750 (2.131 6.599)	<0.001
High ligation of the spermatic vein through the abdominal cavity	24.844 (10.864 56.817)	<0.001	44.000 (17.602 109.988)	<0.001	2.740 (1.435 5.232)	0.002
Microscopic high ligation of spermatic vein	39.656 (17.077 92.089)	<0.001	149.286 (51.980 428.750)	<0.001	23.839 (11.273 50.412)	<0.001
Other (open high ligation of the spermatic vein through inguinal canal and spermatic vein interventional embolization)	9.556 (2.543 35.900)	0.001	25.143 (6.042 104.627)	<0.001	3.750 (1.091 12.886)	0.036

Abbreviations: OR, odds ratio; CI, confidence interval; CNY, Chinese yuan.

Table 3 Multivariable Analysis of Knowledge, Attitude, and Practice

	Knowledge		Attitude		Practice	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Knowledge score			1.051 (1.005 1.098)	0.027	1.091 (1.044 1.139)	<0.001
Attitude score					1.113 (1.027 1.206)	0.009
Age						
≤30 years	Ref.		Ref.		Ref.	
31–40 years	1.424 (0.664 3.053)	0.363	0.996 (0.496 2.001)	0.991	1.022 (0.561 1.862)	0.943
>40 years	0.444 (0.180 1.098)	0.079	0.498 (0.210 1.181)	0.113	0.376 (0.159 0.887)	0.026
Education						
Junior high school and below	Ref.		Ref.		Ref.	
High school/vocational school	10.895 (5.076 23.389)	<0.001	1.912 (0.837 4.367)	0.124	2.196 (0.963 5.006)	0.061
College/bachelor's degree or above	27.899 (10.800 72.070)	<0.001	3.068 (1.109 8.491)	0.031	2.333 (0.897 6.072)	0.082
Average monthly family income, CNY						
<5000	Ref.		Ref.		Ref.	
5000–10,000	0.831 (0.274 2.522)	0.744	0.708 (0.232 2.164)	0.545	1.251 (0.393 3.982)	0.705
10,000–20,000	0.852 (0.251 2.892)	0.798	0.598 (0.172 2.080)	0.419	1.265 (0.366 4.374)	0.710
>20,000	0.669 (0.175 2.561)	0.558	0.576 (0.150 2.214)	0.422	1.693 (0.451 6.361)	0.435
Marital status						
Unmarried	Ref.		Ref.		Ref.	
Married	1.307 (0.606 2.280)	0.495	0.707 (0.316 1.585)	0.400	1.563 (0.810 3.018)	0.183
Divorced/widowed	0.656 (0.137 3.130)	0.597	0.522 (0.113 2.419)	0.406	1.482 (0.298 7.367)	0.631
Duration of illness						
<3 years			Ref.		Ref.	
3–5 years			1.251 (0.440 3.555)	0.674	1.221 (0.529 2.820)	0.640
≥6 years			0.521 (0.204 1.328)	0.172	0.422 (0.197 0.904)	0.027
Surgery						
No surgery	Ref.		Ref.		Ref.	
Laparoscopic surgery	43.623 (17.968 105.910)	<0.001	27.673 (9.141 83.777)	<0.001	0.491 (0.169 1.426)	0.191
High ligation of the spermatic vein through the abdominal cavity	29.871 (11.424 78.105)	<0.001	34.957 (10.792 113.228)	<0.001	0.333 (0.104 1.071)	0.065
Microscopic high ligation of spermatic vein	94.293 (32.532 273.303)	<0.001	77.110 (21.441 277.313)	<0.001	2.961 (0.879 9.974)	0.080
Other (open high ligation of the spermatic vein through inguinal canal and spermatic vein interventional embolization)	14.299 (3.050 67.047)	0.001	21.950 (4.221 114.159)	<0.001	0.990 (0.204 4.806)	0.990

Abbreviations: OR, odds ratio; CI, Confidence interval; CNY, Chinese yuan.

P<0.001), high ligation of the spermatic vein through the abdominal cavity (OR=29.871, 95% CI: 11.424–78.105, P<0.001), microscopic high ligation of the spermatic vein (OR=94.293, 95% CI: 32.532–273.303, P<0.001), and other surgeries (open high ligation of the spermatic vein through inguinal canal and spermatic vein interventional embolization) (OR=14.299, 95% CI: 3.050–67.047, P=0.001) were independently associated with the knowledge scores (Table 3).

Univariable and Multivariable Analysis of Attitude

There were significant differences in attitude scores with knowledge scores, age, education, income, marital status, duration of disease, and surgery (Table 2). The knowledge scores (OR=1.051, 95% CI: 1.005–1.098, P=0.027), college/bachelor's degree or above (OR=3.068, 95% CI: 1.109–8.491, P=0.031), laparoscopic surgery (OR=27.673, 95% CI: 9.141–83.777, P<0.001), high ligation of the spermatic vein through the abdominal cavity (OR=34.957, 95% CI: 10.792–113.228, P<0.001), microscopic high ligation of the spermatic vein (OR=77.110, 95% CI: 21.441–277.313, P<0.001), and other surgeries (open high ligation of the spermatic vein through inguinal canal and spermatic vein interventional embolization) (OR=21.950, 95% CI: 21.441–277.313, P<0.001) were independently associated with the attitude scores (Table 3).

Univariable and Multivariable Analysis of Practice

There were significant differences in attitude scores with knowledge scores, attitude scores, age, education, income, marital status, duration of disease, and surgery (Table 2). The knowledge scores (OR=1.091, 95% CI: 1.044–1.139, P<0.001), attitude scores (OR=1.113, 95% CI: 1.027–1.206, P=0.009), age >40 years (OR=0.376, 95% CI: 0.159–0.887, P=0.026), and duration of illness ≥6 years (OR=0.422, 95% CI: 0.197–0.904, P=0.027) were independently associated with the practice scores (Table 3).

Structural Equation Model

Knowledge had direct effects on attitudes (β=0.357, P<0.001) and practice (β=0.656, P<0.001). Attitude had direct effects on practice (β=1.085, P<0.001) (Figure 1). Table 4 shows that the SEM fit was good.

Discussion

The results suggest that Chinese patients with varicocele have poor knowledge, favorable attitudes, and poor practice toward varicocele. About two-thirds of the participants had adequate knowledge or positive attitudes, while about half of the participants had proactive practice. High school or higher education level and varicocelectomy (irrespective of type) were independently associated with adequate knowledge. Knowledge, college/bachelor's degree education, and varicocelectomy type (irrespective of type) were associated with positive attitudes. In the SEM, knowledge directly influences attitude, knowledge directly influences practice, and attitude directly influences practice. A history of varicocelectomy is associated with better KAP, while no history of varicocelectomy was associated with very poor KAP. This study identified factors that could be the focus of future education interventions in patients with varicocele. This study is the first to examine the KAP toward varicoceles among Chinese patients, providing important data for the management of patients with varicoceles.

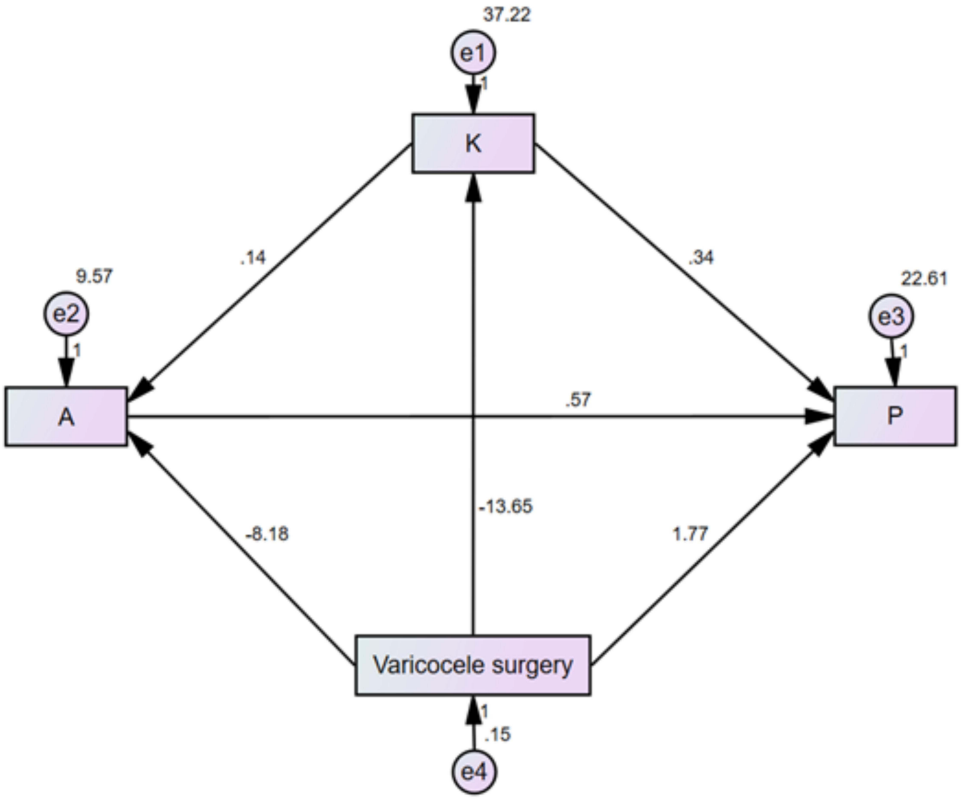

Figure 1 Schematic representation of the structural equation modeling (SEM) analysis for knowledge, attitude, and practice toward varicocele.

Table 4 SEM Analysis Fit Indexes

Indicators	Reference	Actual
CMIN/DF	1–3: Excellent, 3–5: Good	4.589
IFI	>0.8: Good	0.933
TLI	>0.8: Good	0.923
CFI	>0.8: Good	0.932

Abbreviations: CMIN/DF, discrepancy divided by degree of freedom; IFI, incremental fit index; TLI, Tucker-Lewis index; CFI, comparative fit index.

Varicocele is a common benign testicular condition that can threaten public health because of associated infertility[1–3] and mental health issues related to decreased quality of life.[6,7] A proper KAP of varicocele in patients diagnosed with varicocele is relevant to monitor for complications, adopt proper clothing, check for postsurgical recurrence, and be aware of the possible impacts on reproduction and treatment options. Patients with varicocele must also be able to discriminate between the varicocele and other testicular or scrotal lesions that can develop. Of note, it has been shown in various populations that the KAP toward testicular self-examination was poor.[16–18] Other studies showed that the KAP toward benign testicular conditions, including varicocele, was also poor.[11,14,15] Only one study performed specifically in patients with varicocele revealed poor knowledge and decisional conflicts toward varicocele.[10] The present study also revealed poor knowledge of varicoceles among Chinese adults diagnosed with varicoceles. Education was independently associated with better knowledge and attitude. Indeed, the socioeconomic status, including education, is generally associated with better health literacy.[23]

In the same manner, the present study revealed a poor KAP toward varicocele in patients with the disease, but the KAP scores were significantly better in patients who underwent surgery for varicocele, as shown by the multivariable analyses. It is possibly because they received or sought more information when deciding or preparing for surgery.[24,25] Of note, the KAP scores of those who did not undergo surgery were alarmingly low, indicating that such patients severely lack the proper knowledge and skills required to care for their disease properly or eventually make an informed decision to undergo surgery. The exact reasons for such poor KAP could not be precisely determined in the present study. Still, compared with the patients who underwent surgery, those who did not were older, with most patients being >40 years old, suggesting that they lived a long time with the condition and might be used to it, and also because fertility is often less an issue in middle-aged men who already have a family or gave up the thought. The education and income levels of participants who did not undergo surgery were also lower. Socioeconomic status is a well-known factor influencing health literacy.[23]

The present study showed that knowledge was independently associated with attitude and practice and that attitude was independently associated with practice. Those independent associations were confirmed by the SEM analysis. Hence, these results stress that proper education is important to improve the patient's attitudes and practice. Those results align with the KAP theory, which states that knowledge is the basis for practice, while attitude is the driving force to apply that knowledge into practice.[8,9]

This study has limitations. It was a single-center study, leading to a small sample size considering the large number of patients with varicocele. In addition, including a single center can lead to biases due to the geographical area and local medical policies and guidelines. The study was cross-sectional, preventing any analysis of the cause-to-effect relationships. Although SEM was performed, a SEM is based on pre-specified hypotheses of the directions of interactions and does not provide real cause-to-effect relationships. Moreover, the data are only a snapshot of the KAP status of the participants at a precise point in time. Nevertheless, it could serve as a baseline for evaluating the impacts of future interventions. All data were self-reported, and the varicocele grade was not inquired about since most patients are unaware of the information. Finally, all KAP studies are at risk for social desirability bias, in which the participants can be tempted to answer what they know they should do instead of what they are doing.[26,27]

Conclusions

In conclusion, Chinese patients with varicocele have poor knowledge, favorable attitudes, and poor practice toward varicocele. A history of varicocelectomy is associated with better KAP, while no history of varicocelectomy was associated with very poor KAP. This study identified factors that could be the focus of future education interventions in patients with varicocele. Improving KAP should help the patients in their self-management, including when to consult and when seeking surgery, especially if fertility issues are involved.

Data Sharing Statement

All data generated or analyzed during this study are included in this published article.

Ethics Approval and Consent to Participate

The study was carried out after the protocol was approved by the Medical Ethics Committee of the Third Affiliated Hospital of Soochow University (2023-K-164). I confirm that all methods were performed in accordance with the relevant guidelines. All procedures were performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments, and informed consent was obtained from all patients.

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Disclosure

The authors declare that they have no competing interests.

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