

Knowledge, Attitude, and Practice Toward Hallux Valgus Among Women: A Web-Based Cross-Sectional Study

Delong Gao¹, Tao Fu¹, Weitao Dai², Guangwu Liu¹

¹Department of Orthopedic Surgery, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, 430032, People's Republic of China; ²Department of Orthopedic Surgery, Wuhan Tongji Aerospace City Hospital, Wuhan, 430000, People's Republic of China

Correspondence: Guangwu Liu, Department of Orthopedic Surgery, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, No. 1095 Jiefang Avenue, Qiaokou District, Wuhan, Hubei, 430032, People's Republic of China, Email liugw@tjh.tjmu.edu.cn

Purpose: Hallux valgus is a common foot deformity affecting primarily adults and the elderly, especially females, resulting in significant changes in foot architecture and function. This study aimed to investigate the knowledge, attitudes, and practices (KAP) regarding hallux valgus among women.

Patients and Methods: Between July and August 2023, a self-administered questionnaire was utilized to collect demographic data along with KAP scores from 526 women, 291 (55.32%) of whom were over 30 years of age.

Results: The mean scores were 7.04 ± 2.25 for knowledge (range: 0–10), 36.24 ± 2.98 for attitude (range: 11–55), and 25.02 ± 4.90 for practice (range: 7–35). Multivariate logistic regression identified knowledge (OR = 1.335, 95% CI: 1.213–1.469, $P < 0.001$), age over 30 years (OR = 1.517, 95% CI: 1.026–2.244, $P = 0.037$), monthly income above 10,000 Yuan (OR = 1.638, 95% CI: 1.111–2.415, $P = 0.013$), and mild hallux valgus (OR = 1.974, 95% CI: 1.246–3.127, $P = 0.004$) as independently linked to proactive practices. Additionally, the structural equation model indicated a direct effect of knowledge on practice ($\beta = 0.765$, $P < 0.001$).

Conclusion: Women showed adequate knowledge but suboptimal attitudes and proactive practices concerning hallux valgus. Enhancing patient education is vital for improving understanding and addressing misconceptions regarding this condition.

Keywords: knowledge, attitude, practice, hallux valgus, women

Introduction

Hallux valgus, a prevalent foot deformity primarily affecting adults and the elderly, exhibits a notably higher incidence in females,¹ with a striking diagnosis rate ratio of 15:1 compared to men.² This condition involves the deviation of the big toe towards other toes, leading to significant alterations in foot anatomy and biomechanics.³ Contributing factors include hypermobility, genetic predisposition, ill-fitting footwear, and misalignment of the first proximal joint.⁴ The condition is particularly concerning among women due to the interplay of biological predispositions, footwear habits, and lifestyle factors, which may exacerbate its development and progression. Beyond its aesthetic implications, hallux valgus adversely affects gait, arch structure, joint comfort, and overall foot function.² Moreover, individuals with hallux valgus experience reduced quality of life, increased foot pain, diminished mobility, and an elevated risk of falling due to compromised gait stability, underlining the need for effective management and prevention strategies.⁵ In women, these consequences are particularly significant as they can impede daily activities, professional obligations, and social participation, thereby exacerbating the psychological and physical burden of the condition.⁶ Despite its prevalence, there is a lack of targeted strategies tailored to the specific needs and behaviors of women, further emphasizing the importance of exploring their knowledge, attitudes, and practices (KAP).

The Knowledge, Attitude, Practices (KAP) model, originating in the 1950s, has been widely employed in healthcare to assess the knowledge, attitudes, and practices of target populations, particularly in understanding their engagement with healthcare information.⁷ This model posits that knowledge drives attitudes, shaping individual behaviors.⁸ A crucial external factor contributing to hallux valgus development is footwear choice, notably narrow shoes with high heels.⁹ Women's footwear preferences and social expectations surrounding appearance often lead to prolonged use of unsuitable shoes, which significantly increase the risk of hallux valgus. Understanding how women perceive these risks and whether they adjust their behaviors accordingly is crucial for developing effective public health interventions. Despite its higher prevalence among females, there is a pervasive lack of public awareness regarding hallux valgus, often perceived as a cosmetic issue, overlooking potential health risks. Discrepancies between radiographically-assessed and self-recognized hallux valgus highlight a significant gap in understanding.¹⁰ This dissonance suggests that many women may have hallux valgus without symptoms or treatment. Misconceptions, especially among females, may foster the mistaken belief in genetic determination, neglecting the impact of footwear and posture.¹⁰ Such misunderstandings hinder the implementation of preventive strategies, possibly resulting in delayed interventions and challenges in management.¹¹ Additionally, women often prioritize non-surgical approaches, but the effectiveness of these practices remains understudied.¹² Exploring their practices and decision-making processes is essential to inform patient education and healthcare planning, as a lack of understanding in this area may hinder the development of effective strategies. Considering the common occurrence and a notable lack of research regarding this condition, this study aimed to investigate the KAP toward hallux valgus among women. By examining this population, the findings can guide targeted interventions that address misconceptions, enhance preventative behaviors, and improve overall foot health outcomes for women.

Materials and Methods

Study Design and Participants

This cross-sectional study was conducted between July 2023 and August 2023 in Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology. The study enrolled female participants aged 18 years or older on a voluntary basis. Participants were required to complete the electronic questionnaire independently; therefore, individuals with illiteracy, cognitive impairment, or those unable to use smartphones proficiently were effectively excluded in practice. Questionnaires that exhibited a response duration of less than 120 seconds, displayed evident logical inconsistencies, or showed a consistent pattern of selecting identical options for all items were deemed invalid and subsequently excluded from the analysis. This study was approved by the Medical Ethics Committee of our hospital, with ethics number TJ-IRB20230710. Written informed consent was obtained from all participants.

Questionnaire

The questionnaire was developed based on the consensus of Chinese experts in hallux valgus treatment and the ACFAS Clinical Consensus Statement: Hallux Valgus.¹³ Following the initial design phase, the questionnaire underwent a comprehensive review and subsequent revisions, incorporating feedback from two senior ankle and foot specialists. To evaluate its reliability and validity, a pilot test was conducted, involving 32 randomly selected participants. This assessment resulted in a high internal consistency, with a Cronbach's α coefficient of 0.8524.

The final questionnaire was in Chinese (a version translated into English was attached as an [Appendix 1](#)) and consisted of four sections: Basic Information (including age, height, weight, education level, occupation, monthly income, family history of hallux valgus, history of foot trauma, footwear preferences, severity of hallux valgus, pain intensity, flatfoot condition, calluses on the sole, and their locations), Knowledge Dimension, Attitude Dimension, and Practice Dimension. Based on X-ray measurements, hallux valgus severity was categorized into three degrees:¹⁴ (1) Mild: hallux valgus angle (HVA) $< 20^\circ$, intermetatarsal angle (IMA) $< 13^\circ$; (2) Moderate: $20^\circ < \text{HVA} < 40^\circ$, $13^\circ < \text{IMA} < 16^\circ$; (3) Severe: $\text{HVA} > 40^\circ$, $\text{IMA} > 16^\circ$. Pain intensity was assessed using the Visual Analog Scale (VAS) with scores ranging from 0 (no pain) to 10 (worst pain). The Knowledge Dimension comprised 10 questions, each correctly answered earning 1 point, while incorrect or unclear answers received 0 points, with scores ranging from 0 to 10. The Attitude

Dimension contained 11 questions, utilizing a five-point Likert scale. Positive attitude items were scored from strongly agree⁷ to strongly disagree,¹ while negative attitude items were reverse scored. Scores ranged from 11 to 55. The Practice Dimension consisted of 7 questions, with scores ranging from 7 to 35, where always scored 5 and never scored 1. Scores above 70% of the total possible score in each dimension were defined as sufficient knowledge, positive attitude, and positive practice.¹⁵

Distribution and Quality Control

The electronic questionnaire was developed using Questionnaire Star, and QR codes were generated to grant access to the questionnaire for women attending hospital consultations throughout July and August. Participants accessed and completed the questionnaire through the provided QR codes distributed in outpatient clinics, primarily within the Department of Orthopedic Surgery, including foot and ankle specialty clinics. To prevent duplicate responses, IP restriction was implemented, allowing each survey to be completed only once from a single IP address. Subsequently, the collected questionnaires underwent a thorough quality review conducted by members of the research team. Questionnaires with a response time of less than 120 seconds, obvious logical errors, or a consistent pattern of selecting the same options for all items were deemed invalid and subsequently excluded from the analysis.

Sample Size

Due to the scarcity of prior reference literature on hallux valgus, assuming a 50% awareness rate among female participants, a 5% margin of error, α of 0.05, and a 95% confidence interval, PASS21 software calculated an expected sample size of 402. Accounting for a potential dropout rate (20%), the final target was set at 482 participants.

Statistical Analysis

Statistical analysis was performed using SPSS 26 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean \pm standard deviation (SD) and analyzed using *t*-tests or one-way ANOVA. Categorical variables were reported as *n* (%) and assessed with the chi-square test. Pearson's correlation analysis was utilized to determine correlations between knowledge, attitude, and practice. Variables with $P < 0.05$ in univariable logistic regression were considered for inclusion in multivariable logistic regression. Multivariate logistic regression identified factors associated with Knowledge, Attitudes, and Practices (KAP). For regression analysis, each KAP score was converted into a dichotomous variable using the 70% threshold of the maximum possible score, defining sufficient knowledge ($\geq 7/10$), positive attitude ($\geq 38.5/55$), and positive practice ($\geq 24.5/35$).¹⁵ Multicollinearity among independent variables was assessed using the variance inflation factor (VIF), with $VIF < 5$ considered acceptable.

For women with hallux valgus, univariate analysis of the three KAP dimensions did not reveal statistically significant variables, likely due to the small sample size ($n = 148$). As a result, this analysis was not further presented. This decision was made to avoid overinterpretation of nonsignificant findings while maintaining focus on the general and subgroup analysis, where statistically robust results were observed. The interactions among KAP dimensions were evaluated through a structural equation model (SEM) based on the hypotheses that knowledge directly affects attitude and practice, and attitude directly affects practice. Two-sided *P*-values < 0.05 were considered statistically significant.

Results

Initially, 593 participants were included in the study. Subsequently, 4 individuals under the age of 18, 10 who declined to participate, 16 with response times under 120 seconds, 3 with logical errors, and 34 who selected "unclear" for all knowledge questions were excluded, which resulted in a final sample of 526 participants. Among them, 291 (55.32%) were aged over 30 years, 344 (65.40%) had a BMI within the range of 18.5 to 23.9 kg/m², 424 (80.61%) held at least a junior college or bachelor's degree, 456 (86.69%) were employed, 271 (51.52%) had incomes of 10,000 Yuan or less. Additionally, 257 (48.86%) had family history of hallux Valgus and 363 (69.01%) had family history of foot trauma, 308 (58.56%) favored flat or casual shoes in terms of footwear preference. 378 (71.86%) exhibited no severity when assessing

the presence of hallux valgus, and 388 (73.76%) had no flatfoot condition. Furthermore, 141 (47.64%) reported plantar calluses, which predominantly in the heel region, while 230 (43.73%) reported that they had no plantar calluses (Table 1). Of the 148 cases with hallux valgus, 3 (2%) had severe pain, 12 (8%) had moderate pain, 79 (53%) had mild pain, and 54 (37%) had no pain symptoms (Figure 1).

Table 1 Demographic Characteristics and KAP Score

Variables	N(%)	Knowledge, mean \pm SD	P	Attitude, mean \pm SD	P	Practice, mean \pm SD	P
Total Score	526	7.04 \pm 2.25		36.24 \pm 2.98		25.02 \pm 4.90	
Age, year			0.750		0.583		0.020
≤ 30	235 (44.68)	7.08 \pm 2.14		36.32 \pm 3.08		24.47 \pm 4.81	
> 30	291 (55.32)	7.01 \pm 2.33		36.18 \pm 2.90		25.47 \pm 4.93	
BMI (kg/m²)			0.038		0.123		0.651
< 18.5	84 (15.97)	7.18 \pm 2.22		36.52 \pm 3.54		24.77 \pm 5.07	
18.5–23.9	344 (65.40)	7.16 \pm 2.16		36.32 \pm 2.95		25.17 \pm 4.68	
≥ 24	98 (18.63)	6.52 \pm 2.51		35.70 \pm 2.48		24.73 \pm 5.50	
Education			0.002		0.722		0.219
High School or Below	61 (11.60)	6.15 \pm 2.49		35.95 \pm 3.10		24.03 \pm 5.53	
Junior college/Bachelor's	424 (80.61)	7.12 \pm 2.19		36.28 \pm 2.94		25.12 \pm 4.74	
Master's or above	41 (7.79)	7.61 \pm 2.08		36.24 \pm 3.33		25.49 \pm 5.42	
Employment			0.001		0.526		0.106
Employed	456 (86.69)	7.17 \pm 2.15		36.27 \pm 2.94		25.16 \pm 4.76	
Unemployed	70 (13.31)	6.21 \pm 2.63		36.03 \pm 3.25		24.14 \pm 5.69	
Monthly Income, Yuan			0.002		0.003		<0.001
≤10,000	271 (51.52)	6.74 \pm 2.41		35.86 \pm 2.92		24.19 \pm 5.14	
>10,000	255 (48.48)	7.36 \pm 2.02		36.64 \pm 3.00		25.91 \pm 4.47	
Family History of Hallux Valgus			0.040		0.851		0.034
Yes	257 (48.86)	7.28 \pm 2.14		36.28 \pm 3.06		25.41 \pm 4.88	
No	217 (41.25)	6.86 \pm 2.27		36.25 \pm 2.97		24.93 \pm 4.90	
Unknown	52 (9.89)	6.60 \pm 2.53		36.02 \pm 2.68		23.50 \pm 4.75	
History of Foot Trauma			0.047		0.529		0.054
Yes	163 (30.99)	7.33 \pm 2.35		36.36 \pm 3.06		25.64 \pm 5.21	
No	363 (69.01)	6.91 \pm 2.19		36.18 \pm 2.95		24.75 \pm 4.74	
Footwear Preference			0.450		0.182		0.260
Sports Shoes	177 (33.65)	7.16 \pm 2.14		36.29 \pm 3.11		25.29 \pm 4.58	
High Heels	41 (7.79)	6.68 \pm 2.56		35.41 \pm 2.87		25.88 \pm 5.69	
Flat/Casual Shoes	308 (58.56)	7.02 \pm 2.26		36.32 \pm 2.91		24.76 \pm 4.96	
Severity of Hallux Valgus			0.599		0.001		<0.001
None	378 (71.86)	7.00 \pm 2.24		36.52 \pm 2.96		24.48 \pm 4.82	
Mild	126 (23.95)	7.21 \pm 2.30		35.67 \pm 2.79		26.32 \pm 4.86	
Moderate/Severe	22 (4.18)	6.82 \pm 2.02		34.77 \pm 3.62		26.95 \pm 4.85	
Flatfoot Condition			0.001		0.484		0.003
Yes	87 (16.54)	7.66 \pm 1.74		36.33 \pm 3.08		26.60 \pm 4.57	
No	388 (73.76)	7.01 \pm 2.29		36.28 \pm 2.96		24.79 \pm 4.91	
Unknown	51 (9.70)	6.22 \pm 2.38		35.76 \pm 2.99		24.14 \pm 4.88	
Plantar Calluses			0.214		0.340		0.766
Forefoot	129 (43.58)	7.40 \pm 1.86		36.14 \pm 2.87		25.43 \pm 5.12	
Heel	141 (47.64)	6.84 \pm 2.37		36.34 \pm 2.86		24.72 \pm 4.63	
Dorsal Side of Toes	5 (1.69)	6.40 \pm 3.13		34.20 \pm 3.42		24.20 \pm 1.92	
Medial Side of Big Toe	21 (7.09)	7.38 \pm 2.31		35.43 \pm 2.34		24.48 \pm 4.80	
None	230 (43.73)	6.95 \pm 2.33		36.35 \pm 3.15		25.05 \pm 5.00	

Notes: P values calculated using t-tests or one-way ANOVA for continuous variables. P < 0.05 considered statistically significant.

Abbreviations: SD, standard deviation; BMI, body mass index.

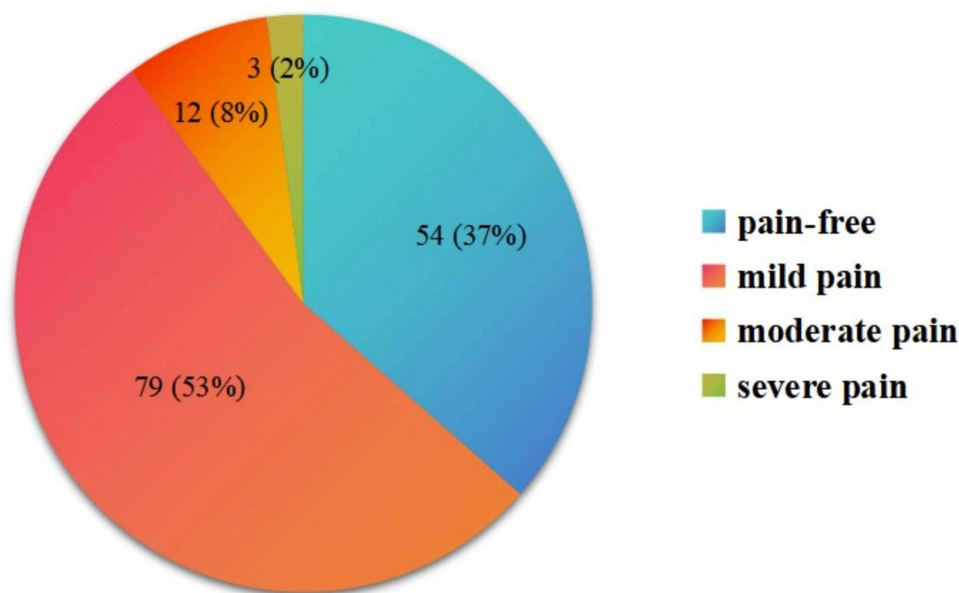


Figure 1 The pain levels among individuals with hallux valgus (148 cases).

The mean knowledge score was 7.04 ± 2.25 (possible range: 0–10), the mean attitude score was 36.24 ± 2.98 (possible range: 11–55), and the mean practice score was 25.02 ± 4.90 (possible range: 7–35). Participants aged over 30 years exhibited a more positive attitude ($p = 0.020$), while those with a BMI between $18.5\text{--}23.9 \text{ kg/m}^2$ ($p = 0.038$) and a master's degree or higher ($p = 0.002$) displayed enhanced knowledge. Moreover, individuals earning over 10,000 Yuan per month demonstrated significantly improved knowledge, attitude, and practice ($p = 0.002$, $p = 0.003$, $p < 0.001$, respectively). A family history of hallux valgus correlated with higher levels of knowledge ($p = 0.040$) and proactive practice ($p = 0.034$), and a family history of foot trauma was also associated with increased knowledge ($p = 0.047$). Participants with moderate/severe conditions exhibited a less positive attitude ($p = 0.001$) but engaged in the highest practice ($p < 0.001$). Furthermore, the presence of a flatfoot condition was linked to improved knowledge ($p = 0.001$) and practice ($p = 0.003$) (Table 1). The details of participants' response to the questions in KAP dimensions were exhibited in Tables S1–S3.

Correlation analysis showed that significant positive correlations were observed between knowledge and attitude ($r = 0.166$, $P < 0.001$), knowledge and practice ($r = 0.352$, $P < 0.001$), as well as attitude and practice ($r = 0.127$, $P = 0.004$) (Table S4).

Collinearity diagnostics showed that all independent variables included in the multivariate logistic regression models had VIF values less than 5, indicating no significant multicollinearity (Table S5).

For general population, multivariate logistic regression showed that, master's or above (OR = 2.694, 95% CI: 1.107–6.555, $P = 0.029$), history of foot trauma (OR = 1.722, 95% CI: 1.150–2.578, $P = 0.008$), unknown of flatfoot condition (OR = 0.400, 95% CI: 0.206–0.775, $P = 0.007$) were independently associated with knowledge. Knowledge (OR = 1.143, 95% CI: 1.052–1.242, $P = 0.002$), mild cases of hallux valgus (OR = 0.583, 95% CI: 0.381–0.893, $P = 0.013$) and severe cases of hallux valgus (OR = 0.352, 95% CI: 0.125–0.989, $P = 0.048$) were independently associated with attitude. Knowledge (OR = 1.335, 95% CI: 1.213–1.469, $P < 0.001$), age over 30 years (OR = 1.517, 95% CI: 1.026–2.244, $P = 0.037$), monthly income above 10,000 Yuan (OR = 1.638, 95% CI: 1.111–2.415, $P = 0.013$), and mild cases of hallux valgus (OR = 1.974, 95% CI: 1.246–3.127, $P = 0.004$) were independently associated with practice (Table 2).

For the subgroup without hallux valgus, multivariate logistic regression showed that knowledge (OR = 1.297, 95% CI: 1.155–1.456, $P < 0.001$), attitude (OR = 1.114, 95% CI: 1.030–1.204, $P = 0.007$), and monthly income above 10,000 Yuan (OR = 1.691, 95% CI: 1.089–2.624, $P = 0.019$) were independently associated with practice (Table 3).

Table 2 Multivariate Analysis for General Population

	Knowledge		Attitude		Practice	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Knowledge Dimension			1.143 (1.052–1.242)	0.002	1.335 (1.213–1.469)	<0.001
Attitude Dimension					1.061 (0.994–1.132)	0.077
Age, year					Ref	
≤ 30						
> 30					1.517 (1.026–2.244)	0.037
BMI (kg/m²)						
< 18.5			0.954 (0.585–1.556)	0.851		
18.5–23.9			Ref			
≥ 24			0.641 (0.394–1.044)	0.074		
Education					Ref	
High School or Below	Ref				Ref	
Junior college/Bachelor's	1.675 (0.916–3.062)	0.094			1.621 (0.849–3.094)	0.143
Master's or above	2.694 (1.107–6.555)	0.029			1.149 (0.462–2.858)	0.764
Employment						
Employed	1.203 (0.686–2.111)	0.519				
Unemployed	Ref					
Monthly Income, Yuan						
≤ 10,000	Ref		Ref		Ref	
> 10,000	1.268 (0.876–1.835)	0.209	1.330 (0.927–1.909)	0.121	1.638 (1.111–2.415)	0.013
Family History of Hallux Valgus						
Yes	1.227 (0.836–1.801)	0.297				
No	Ref					
Unknown	1.143 (0.604–2.163)	0.680				
History of Foot Trauma						
Yes	1.722 (1.150–2.578)	0.008			1.114 (0.734–1.692)	0.611
No	Ref				Ref	
Severity of Hallux Valgus						
None			Ref		Ref	
Mild			0.583 (0.381–0.893)	0.013	1.974 (1.246–3.127)	0.004
Moderate/Severe			0.352 (0.125–0.989)	0.048	2.599 (0.985–6.858)	0.054
Flatfoot Condition						
Yes	0.999 (0.602–1.656)	0.997				
No	Ref					
Unknown	0.400 (0.206–0.775)	0.007				

Note: Multivariate logistic regression was used. P < 0.05 considered statistically significant.

Abbreviations: OR, odds ratio; CI, confidence interval; ref, reference group.

Table 3 Multivariate Analysis for the Subgroup Without Hallux Valgus

	Knowledge		Attitude		Practice	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Knowledge Dimension				<0.001	1.297 (1.155–1.456)	<0.001
Attitude Dimension					1.114 (1.030–1.204)	0.007
Age, year						
≤ 30						
> 30						

(Continued)

Table 3 (Continued).

	Knowledge		Attitude		Practice	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
BMI (kg/m²)						
< 18.5			0.657 (0.375–1.152)	0.143		
18.5–23.9			Ref			
≥ 24			0.619 (0.347–1.104)	0.104		
Education						
High School or Below	Ref					
Junior college/Bachelor's	1.474 (0.706–3.079)	0.302				
Master's or above	2.411 (0.804–7.236)	0.116				
Employment						
Employed	1.406 (0.730–2.708)	0.309				
Unemployed	Ref					
Monthly Income, Yuan						
≤ 10,000	Ref				Ref	
> 10,000	1.292 (0.835–2.000)	0.250			1.691 (1.089–2.624)	0.019
Family History of Hallux Valgus						
Yes					0.667 (0.411–1.082)	0.101
No					Ref	
Unknown					0.506 (0.245–1.046)	0.066
History of Foot Trauma						
Yes	1.549 (0.935–2.566)	0.089				
No	Ref					
Severity of Hallux Valgus						
None						
Mild						
Moderate/Severe						
Flatfoot Condition						
Yes	2.268 (1.073–4.797)	0.032				
No	Ref					
Unknown	0.422 (0.196–0.908)	0.027				

Note: Multivariate logistic regression was used. P < 0.05 considered statistically significant.

Abbreviations: OR, odds ratio; CI, confidence interval; ref, reference group.

Moreover, SEM analysis showed that knowledge directly affects practice ($\beta = 0.765$, $P < 0.001$) but has no direct effect on attitude ($\beta = 0.181$, $P = 0.513$). Attitude also had no direct effect on practice ($\beta = -0.001$, $P = 0.944$) (Figure S1 and Table 4).

Table 4 SEM Pathways

			β	S.E.	C.R.	P
Attitude	<–	Knowledge	0.181	0.276	0.655	0.513
Practice	<–	Attitude	–0.001	0.021	–0.070	0.944
Practice	<–	Knowledge	0.765	0.149	5.135	<0.001

Note: P < 0.05 considered statistically significant.

Abbreviations: β , standardized path coefficient; S.E., standard error; C.R., critical ratio.

Discussion

Women exhibited adequate knowledge, suboptimal attitudes, and proactive practices toward hallux valgus. Patient education is crucial for accurate information and dispelling misconceptions. Recognizing the psychosocial impact and offering emotional support are essential. Tailoring interventions based on demographics and clinical factors is also necessary. This is the first study focusing on KAP toward Hallux Valgus among Women. Existing literature primarily focuses on surgical and non-surgical management of hallux valgus, exploring factors influencing surgeons' choices,¹⁶ podiatrists' perspectives on non-surgical approaches,¹² and patient-reported outcomes post-surgery.¹⁷ In contrast, this study uniquely examines women's knowledge, attitudes, and practices towards hallux valgus, providing valuable insights from a patient-centric perspective.

Among participants, a spectrum of knowledge about hallux valgus emerged, encompassing well-grasped facts about potential deterioration without intervention and available treatment options, alongside misconceptions, particularly the belief in the condition's non-recurrence post-treatment. This amalgamation underscores the need for comprehensive patient education initiatives, emphasizing the recurrent nature of hallux valgus.^{11,18}

The study unveiled favorable attitudes towards hallux valgus prevention and management. Participants acknowledged the efficacy of measures like wearing suitable footwear, customizing insoles, and correcting shoe-wearing habits.^{1,19} However, concerns about appearance and quality of life, even without pain symptoms, were expressed. A noteworthy percentage preferred conservative, non-surgical treatment options, emphasizing the need for healthcare providers to address psychosocial aspects and integrate counseling and support services into patient care plans.²⁰

Proactive measures in prevention and management were evident, with participants changing footwear regularly, avoiding ill-fitting shoes, and monitoring toe appearance and foot pain. Some engaged in exercises to strengthen foot muscles and manage weight, indicating commitment to mitigating hallux valgus risks. While self-awareness and proactive practices were noted, a significant portion expressed an inclination towards self-diagnosis, highlighting the importance of professional evaluation.^{6,21}

Furthermore, our result highlights that over 60% of women with hallux valgus reported at least mild pain, and only a minority (37%) were asymptomatic. This indicates that even in the absence of severe deformity, discomfort is common and can negatively affect quality of life. These findings suggest a need for early identification and management strategies, even in mild or asymptomatic cases, to prevent progression and functional decline. Multivariate logistic regression linked higher education to better foot health knowledge, highlighting the role of education in health awareness. Tailored education for lower educational attainment is crucial. Surprisingly, those unaware of their flatfoot condition had lower knowledge, suggesting the need for improved patient education. Additionally, knowledge correlated with a positive attitude, emphasizing the importance of educational initiatives. Severity of hallux valgus influenced attitude, warranting emotional support for severe cases.²² Knowledge also played a crucial role in foot health practices, underlining the significance of patient education for behavior change.²³ Younger age groups and economically disadvantaged individuals may benefit from targeted interventions.

The subgroup analysis provided additional insights, particularly into the KAP of individuals without hallux valgus. Knowledge and attitude were both significantly associated with practice in this subgroup, with the strength of these associations being slightly higher compared to the general population. This finding underscores the importance of early preventive education to encourage proactive behaviors before the development of hallux valgus. For instance, knowledge was strongly associated with practice in the subgroup, suggesting that targeted interventions aimed at improving awareness in individuals without hallux valgus could help reduce future disease incidence. Furthermore, the subgroup analysis highlighted the influence of socio-economic factors. Participants with higher monthly income were more likely to engage in preventive practices, emphasizing the role of financial resources in accessing suitable footwear and care.^{24,25} In addition, those unaware of their flatfoot condition showed significantly lower knowledge scores, indicating a critical gap in awareness that could hinder early prevention.

Correlation analysis conducted highlighted the intricate relationship between knowledge, attitudes, and practices regarding hallux valgus. Knowledge exhibited positive correlations with both attitude and practice, underscoring its pivotal role in shaping individuals' attitudes and behaviors. However, SEM analysis provided further insights, revealing that knowledge had a direct effect solely on practice, emphasizing the direct impact on attitudes. Healthcare providers should prioritize efforts to enhance patients' knowledge, recognizing its indirect influence on attitudes and its direct impact on practices. Clear and accessible educational resources are imperative for informed decision-making about hallux valgus management and prevention.^{26,27} The observed positive correlations among knowledge, attitude, and practice, though statistically significant, varied in strength. The

strongest correlation was between knowledge and practice, suggesting that improved knowledge has a more direct influence on proactive health behaviors than on attitudes. Interestingly, SEM analysis confirmed a strong direct path from knowledge to practice, while no significant path was observed from knowledge to attitude or from attitude to practice. This diverges slightly from the traditional KAP model, where attitude is often a mediating factor. These findings underscore the importance of focusing health education directly on actionable knowledge to improve preventive behaviors regarding hallux valgus. However, it is important to note that while knowledge is a necessary component, it may not always translate into changes in attitude or behavior, as these are also influenced by emotional, cultural, and contextual factors.

This study has several limitations. The cross-sectional design limits causal inference and the ability to capture temporal changes. The reliance on self-administered questionnaires introduces potential response bias, and the exclusively female sample may not be representative of all populations. Knowledge, attitude, and practice assessments, relying on self-reported data, may not precisely reflect reality and could be influenced by recall and social desirability biases. Given the predominantly female and educationally homogeneous participant base, with limited racial and BMI diversity, the findings may not be readily generalizable to a broader population.

Conclusion

In conclusion, this study revealed that women exhibited adequate knowledge, suboptimal attitudes, and proactive practices toward hallux valgus. By emphasizing patient education, addressing psychosocial aspects, and tailoring interventions, clinical practitioners can significantly contribute to improved patient outcomes. Further research should explore additional factors that may influence hallux valgus awareness and management, enabling more targeted and effective interventions.

Data Sharing Statement

All data generated or analyzed during this study are included in this article and supplementary information files.

Ethics Approval and Consent to Participate

This work has been carried out in accordance with the Declaration of Helsinki (2000) of the World Medical Association. This study was approved by the Medical Ethics Committee of Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, with ethics number TJ-IRB20230710. Written informed consent was obtained from all participants.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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