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Knowledge, Attitudes, and Practices Among Guardians of Boys Toward Concealed Penis

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Background and Objective: Concealed penis (CP) is a condition involving a congenital abnormality of the external genitalia, wherein the penile shaft is partially or completely obscured by surrounding skin tissues, negatively affecting the psychological and physical health of children. The guardians, who are primarily responsible for the daily care of children, play a crucial role in the early detection of this condition. Therefore, this study aims to explore knowledge, attitude, and practices (KAP) toward CP among guardians of young boys; results would provide a theoretical basis for the development of health education programs.

Methods: This web-based cross-sectional study was conducted among guardians of boys in the Department of Pediatric Surgery, local hospital between June 2023 and September 2023. A self-designed questionnaire was developed to collect demographic information of the guardians and to assess their knowledge, attitudes and practices toward CP.

Results: A total of 394 questionnaires were collected. Among the guardians, 143 (36.29%) of them were male, 375 (95.18%) were the parents of the children, 279 (70.81%) had a junior college or bachelor's degree, and 46 (11.68%) reported their children had CP. The knowledge, attitudes and practices scores were 4.00±2.00 (possible range: 0–7), 35.63±3.40 (possible range: 9–45), and 23.03±6.97 (possible range: 9–45), respectively. The structural equation model demonstrated that knowledge had direct effects on attitudes (β=0.63, $p<0.001$), and practices (β=0.81, $p<0.001$). Moreover, attitudes had direct effects on practices (β=0.43, $p<0.001$).

Conclusion: This study found insufficient knowledge, positive attitudes, but poor practices toward the CP in guardians of boys, especially among participants from rural areas of families with lower income. It is recommended to tailor educational initiatives and implement strategies to bridge the knowledge-practice gap toward concealed penis in boys.

Keywords: knowledge. attitudes, practices, concealed penis, cross-sectional study

Introduction

Concealed penis (CP) is a noteworthy external genital malformation that has garnered growing attention due to its distinctive morphological features and consequential functional impairment.[1] It is manifested as a penis hidden in the groin instead of being visible on the body's surface.[2] CP can be easily overlooked, especially in infancy and early childhood.[3] If left undiagnosed and untreated, CP can lead to various complications and psychosocial trauma.[4] Previous research has demonstrated that prolonged confinement of the penis beneath the skin can not only inflict certain damage on the structure and functionality of the penile corpora cavernosa, but can also lead to symptoms similar to those of phimosis or paraphimosis, such as recurrent balanoposthitis, urinary tract infections, and difficulty urinating.[1,5] As age advances, the psychological stress on patients gradually intensifies; this situation can also cause significant anxiety for parents, hence the growing attention towards this condition in recent years.[6,7]

In current medical practice, the key to CP management lies in its early identification and intervention.[8] The guardians, who are primarily responsible for the daily care of children, play a crucial role in the early detection of such abnormalities. Prompt recognition allows for early intervention, potentially controlling the progression of the condition.[9] A lack of necessary knowledge and awareness among guardians may lead to delays in the diagnosis and treatment of CP, resulting in unfavorable outcomes. Moreover, psychological support from guardians during the

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treatment process is crucial for the outcome and prognosis of CP. However, it is common for parents to experience anxiety regarding their child's penile function and appearance, largely due to their limited understanding of the disease.[10] Therefore, establishing adequate knowledge about CP is essential for guardians of boys.

The knowledge, attitude, and practices (KAP) survey is based on the theory that human behavior change comprises three continuous processes: acquiring knowledge, forming beliefs, and adopting behaviors.[11,12] Understanding the KAP among guardians of boys toward the management of CP is crucial for providing valuable insights to optimize health education and disease management strategies in this population. Prior studies have reported poor awareness and low treatment rates of CP,[13,14] but KAP among guardians of boys toward CP and the interplay among specific KAP dimensions are still largely unknown.

Thus, this study aims to explore knowledge, attitude, and practices towards concealed penis among guardians of young boys. Results would provide a theoretical basis for the development of health education programs addressing this condition.

Materials and Methods

Study Design and Participants

This cross-sectional survey was conducted at the Department of Pediatric Surgery, West China Hospital, Sichuan University, between June 2023 and September 2023. Guardians of boys who were aged 6 months to 14 years were included in this study. Participants who reported involvement in similar studies or whose questionnaires exhibited logical inconsistencies, failing to pass the trap questions (K3 & K4, as outlined in *Questionnaire*), were excluded. This study was conducted in accordance with the Declaration of Helsinki; study protocol was approved by the Ethics Committee on Biomedical Research, West China Hospital, Sichuan University (2023 Annual Review (539) No) date: 2023/6/2 and informed consent was obtained from the study participants.

Questionnaire

The questionnaire was designed with reference to the Chinese Expert Consensus on the Diagnosis and Treatment of Concealed Penis in Children and previous studies,[10,15,16] and was modified by the specialist from pediatric urology department at the West China Hospital. A pilot test was conducted (n=30), and Cronbach's α coefficient value was 0.90, indicating a good internal consistency.

The final questionnaire was in Chinese and contained four dimensions: demographic characteristics, knowledge, attitude and practice. The knowledge dimension comprised 9 questions, out of which K3 and K4 were designed as logical trap questions with the same meaning but opposite answers, to assess the validity of answers and respondents' attention. No matter what respondents believed the right answer was, it should be different (thus questionnaires with both answers either true or false were excluded). The trap questions were not scored, while the remaining questions were awarded 1 point for correct answers and 0 points for incorrect ones. The possible score range for the knowledge dimension was 0 to 7 points. The attitude and practices dimensions each consisted of 9 questions, which were rated using a 5-point Likert scale. For the attitude dimension, answers indicating "strongly agree", "agree", "neutral", "disagree", and "strongly disagree" were scored as 5, 4, 3, 2, and 1, respectively. However, questions 4 and 8 were reverse scored, with "strongly agree" being given 1 point and "strongly disagree" being given 5 points. In the practices dimension, answers indicating "Always", "Often", "Sometimes", "Occasionally", and "Never" were scored as 5, 4, 3, 2, and 1, respectively. This study defines them as follows: "Always" corresponds to more than six occurrences within the past two months; "Often" refers to five to six occurrences within the same period; "Sometimes" denotes three to four occurrences; "Occasionally" is defined as one to two occurrences; and "Never" indicates zero occurrences within the past two months. Both the total attitude scores and practices scores ranged from 9 to 45 points.

The web-based questionnaire was hosted on Sojump (http://www.sojump.com), an online survey platform. The questionnaire link was distributed to participants via Quick Response Code or through a WeChat group. Before answering the questions, participants were required to click the option "I agree to participate in this study" at the beginning of the e-questionnaire. All data were collected anonymously, and to prevent duplication, IP restriction was applied, allowing only one completion of the survey from a single IP address.

Statistical Analysis

STATA 17.0 (STATA Corporation, College Station, TX, USA) was utilized for statistical analyses. The sample size was calculated using single population proportion formula based on the assumption that the probability of having low K, A, P scores was 50.0%, at 95% CI, 5% margin of error; and determined to be at least 384. Continuous variables were presented as mean ± standard deviation (SD) and were compared using the Student's *t*-test or one-way analysis of variance (ANOVA). Categorical variables were presented as numbers (percentages). In this study, 70% of the total score was used as the cut-off value,[17] that means the threshold for sufficient knowledge, positive attitudes, and proactive practices were 4.9, 31.5 and 31.5 points respectively. Correlations between KAP scores were analyzed using Pearson's analysis. AMOS 24.0 (IBM, NY, USA) was utilized to construct a structural equation model (SEM) examining the KAP among guardians of boys toward concealed penis. This SEM tested the main hypotheses according to the KAP framework as follows: 1) Knowledge had direct effects on attitude, 2) Knowledge had direct effects on practice, and 3) Attitude had direct effects on practice.

Results

Demographic Characteristics and KAP Scores

Initially, a total of 445 questionnaires were collected. After eliminating those with logical inconsistencies in their responses to trap questions (K3 & K4), 394 questionnaires were deemed valid, resulting in a validity rate of 88.54%. Among them, 143 (36.29%) were filled by male participants and 375 (95.18%) by parents of children. Additionally, 46 participants (11.68%) reported that their children had been diagnosed with CP. The mean scores for KAP were 4.00±2.00 (possible range: 0–7), 35.63±3.40 (possible range: 9–45), and 23.03±6.97 (possible range: 9–45), respectively. This study revealed that guardians resided in urban areas had significantly higher KAP scores than their counterparts in rural areas (P<0.001). Those with monthly household per capita income for more than 20,000 CNY had the highest knowledge and attitudes scores among all the range of income (P<0.001) (Table 1).

Table 1 Demographic Information and Knowledge, Attitude and Practices Scores

Characteristics	N (%)	Knowledge		Attitude		Practices	
		Mean ± SD	P	Mean ± SD	P	Mean ± SD	P
Total	394	4.00 ± 2.00		35.63 ± 3.40		23.03 ± 6.97	
Gender			0.740		0.230		0.291
Male	143 (36.29)	3.96 ± 2.05		35.36 ± 3.40		23.52 ± 7.05	
Female	251 (63.71)	4.03 ± 1.98		35.78 ± 3.40		22.75 ± 6.92	
Age (years)	34.98 ± 6.42						
Relationship			0.239		0.013		0.151
Parents	375 (95.18)	4.03 ± 1.99		35.73 ± 3.39		23.15 ± 6.94	
Other Guardians	19 (4.82)	3.47 ± 2.27		33.74 ± 3.19		2079 ± 7.35	
Residence			<0.001		<0.001		<0.001
Urban	327 (82.99)	4.21 ± 1.93		35.96 ± 3.38		23.57 ± 6.86	
Rural	67 (17.01)	2.97 ± 2.06		34.00 ± 3.06		20.40 ± 6.94	
Marital status			0.188		0.028		0.008
Married	379 (96.19)	4.03 ± 2.00		35.70 ± 3.41		23.22 ± 6.92	
Unmarried	15 (3.81)	3.33 ± 1.95		33.73 ± 2.71		18.33 ± 6.78	
Education			<0.001		<0.001		0.084
Middle school and below	37 (9.39)	2.24 ± 2.02		33.35 ± 3.27		20.41 ± 7.39	
High school and Technical secondary school	45 (11.42)	3.93 ± 1.84		34.93 ± 3.04		23.04 ± 5.86	
Junior college or bachelor's degree	279 (70.81)	4.21 ± 1.92		35.97 ± 3.33		23.46 ± 6.97	
Master's degree and above	33 (8.38)	4.33 ± 1.98		36.21 ± 3.60		22.33 ± 7.50	

(*Continued*)

Table 1 (Continued).

Characteristics	N (%)	Knowledge		Attitude		Practices	
		Mean ± SD	P	Mean ± SD	P	Mean ± SD	P
Occupation			<0.001		<0.001		0.019
Medical related occupations	77 (19.54)	4.77 ± 1.91		36.58 ± 3.48		22.16 ± 7.06	
Other occupations	269 (68.27)	4.01 ± 1.93		35.70 ±3.27		23.72 ± 7.03	
Retired	6 (1.52)	3.50 ± 2.26		33.17 ± 3.25		20.33 ± 7.87	
Unemployed	42 (10.66)	2.62 ± 1.91		33.79 ± 3.34		20.60 ± 5.57	
Monthly household per capita income (CNY)			<0.001		<0.001		0.072
<2000	16 (4.06)	2.06 ± 2.26		33.00 ± 3.37		19.88 ± 6.37	
2000–5000	71 (18.02)	3.61 ± 1.95		34.92 ± 3.48		22.06 ± 6.77	
5000–10,000	140 (35.53)	3.98 ± 1.97		35.32 ± 3.09		22.89 ± 6.57	
10,000–20,000	113 (28.68)	4.16 ± 2.10		36.11 ± 3.34		23.43 ± 7.19	
>20,000	54 (13.71)	4.83 ± 1.31		37.15 ± 3.48		24.80 ± 7.61	
Age of the child, years	6.37 ± 4.64						
Diagnosis of concealed penis			<0.001		0.380		<0.001
Yes	46 (11.68)	5.13 ± 1.39		36.04 ± 3.44		26.83 ± 6.99	
No	348 (88.32)	3.85 ± 2.03		35.57 ± 3.40		22.53 ± 6.82	
Age at diagnosis (years)	4.06 ± 3.49						
Intellectual disabilities of the child			0.569		0.478		0.030
Yes	4 (1.02)	4.75 ± 0.96		34.75 ± 4.57		24.75 ± 6.13	
No	390 (98.98)	3.99 ± 2.01		35.64 ± 3.39		23.02 ± 6.98	

Abbreviations: SD, standard deviation; CNY, Chinese yuan.

Knowledge

This study revealed that guardians of children diagnosed with CP demonstrated significantly higher knowledge compared to guardians of undiagnosed CP children (5.13 ± 1.39 vs 3.85 ± 2.03, P<0.001) (Table 1). Thus, this study conducted a detailed examination of the disparities in knowledge scores between these two groups across various items. The findings indicated that comparing to guardians of children without CP, guardians of diagnosed CP children showed better knowledge in certain aspects, including CP definition (K1, correctness rate 86.96% vs 51.72%), disease characteristics and potential risks (K5, correctness rate 95.65% vs 72.41%), as well as the optimal timing for CP surgical intervention (K9, 95.65% vs 75.00%) (Table 1). Considering the overall score, the three questions with the highest accuracy rates in the knowledge dimension were

> If surgical treatment is necessary, the optimal age for surgery is around the time of entering school, as this can help reduce adverse psychological/physiological effects and aid in the postoperative recovery of the affected children (K9),

with a correctness rate of 77.41%,

> Concealed penis manifests as a short external appearance of the penis, potentially leading to symptoms such as difficulty in urination and urinary tract infections due to phimosis narrowing (K5),

with a correctness rate of 75.13% and

> Concealed penis does not have an impact on children's psychological well-being (K7),

with a correctness rate of 65.23%. However, it is worth noting that the majority of parents harbor a misconception regarding the primary choice of treatment for concealed penis. Erroneously, they believe that surgical intervention is the preferred approach over observation and conservative management (K8), with an accuracy rate of only 6.09% (Figure 1).

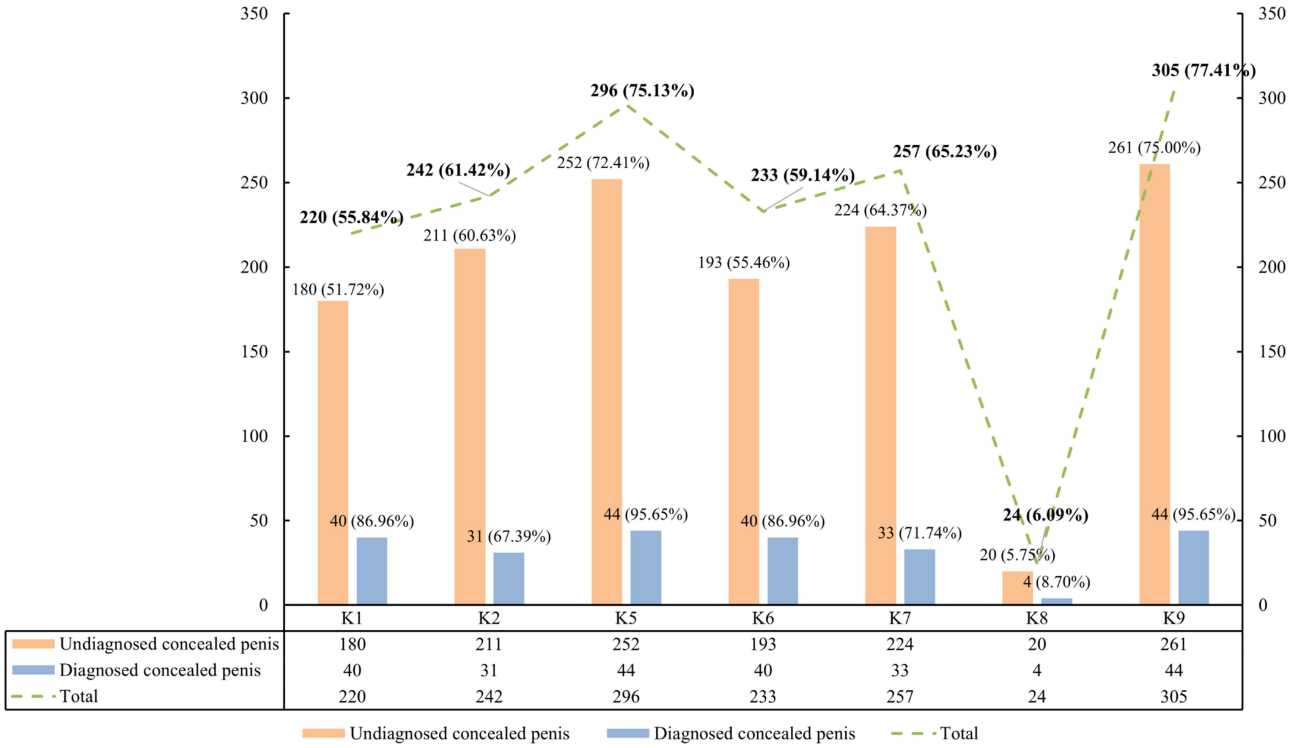

Figure 1 Knowledge dimension.

Attitudes

This study found no significant difference in the attitude scores between guardians of children with and without CP (Supplementary Table 1). Considering the overall score, it was found that 378 guardians (95.94%) either strongly agree or agree that parental self-efficacy is crucial in managing their child's concealed penis, emphasizing the provision of appropriate life and psychological guidance (A9). Additionally, 383 (97.21%) of participants reported that if their child discovers any unusual sensations in the genital area, such as dysuria, they would take it seriously (A7). However, 96 (24.36%) of them, nearly a quarter, believed that since children are not yet mentally mature, concealed penis is unlikely to cause psychological problems in them (A4). Moreover, 348 (88.32%) of them acknowledged that if their child has concealed penis, they may feel anxious and concerned about its potential effect on the child's reproductive capacity (A8) (Figure 2).

Practice

A detailed examination of the disparities in practices scores revealed that guardians of children diagnosed with CP more often actively seek disease-specific information (P1, 13.04% vs 3.74%), express concerns about aberrant and discomforting behaviors in boys (P4, 17.39% vs 6.61%), and pay more attention to the appearance of male genitalia (P5, 21.74% vs 9.48%) in comparison to guardians of undiagnosed children (Supplementary Table 2). Considering the overall score, there was a discrepancy between positive attitude and actual engagement in disease management practice. Merely 49 parents (12.43%) reported encountering information about concealed penis through various channels. Likewise, only 25 parents (6.34%) acknowledged their participation in lectures or scientific activities related to concealed penis disease management (P3), and merely 47 parents (11.93%) frequently engage in discussions with other parents of boys regarding their growth and development (P2). Furthermore, only 101 parents (25.64%) claimed that they regularly pay attention to any abnormalities in their male child's urination or notice signs of discomfort during this process in their daily life (P4) (Figure 3).

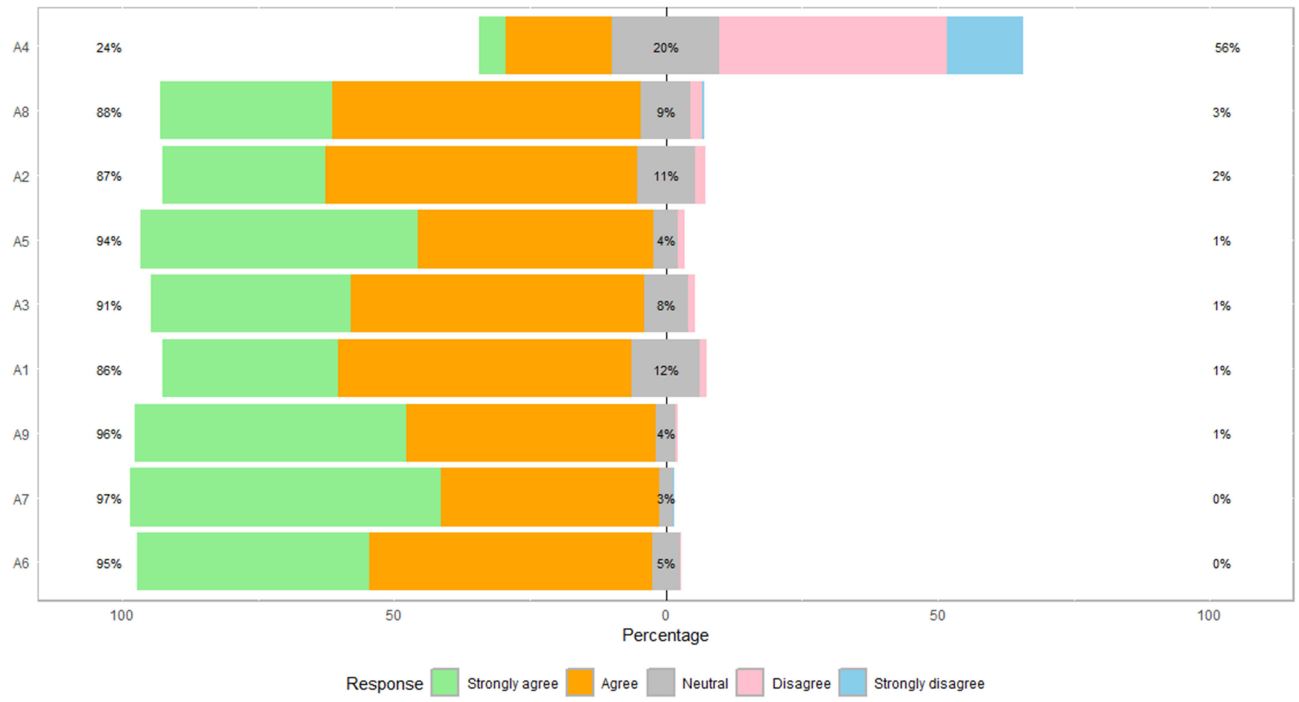

Figure 2 Attitude dimension.

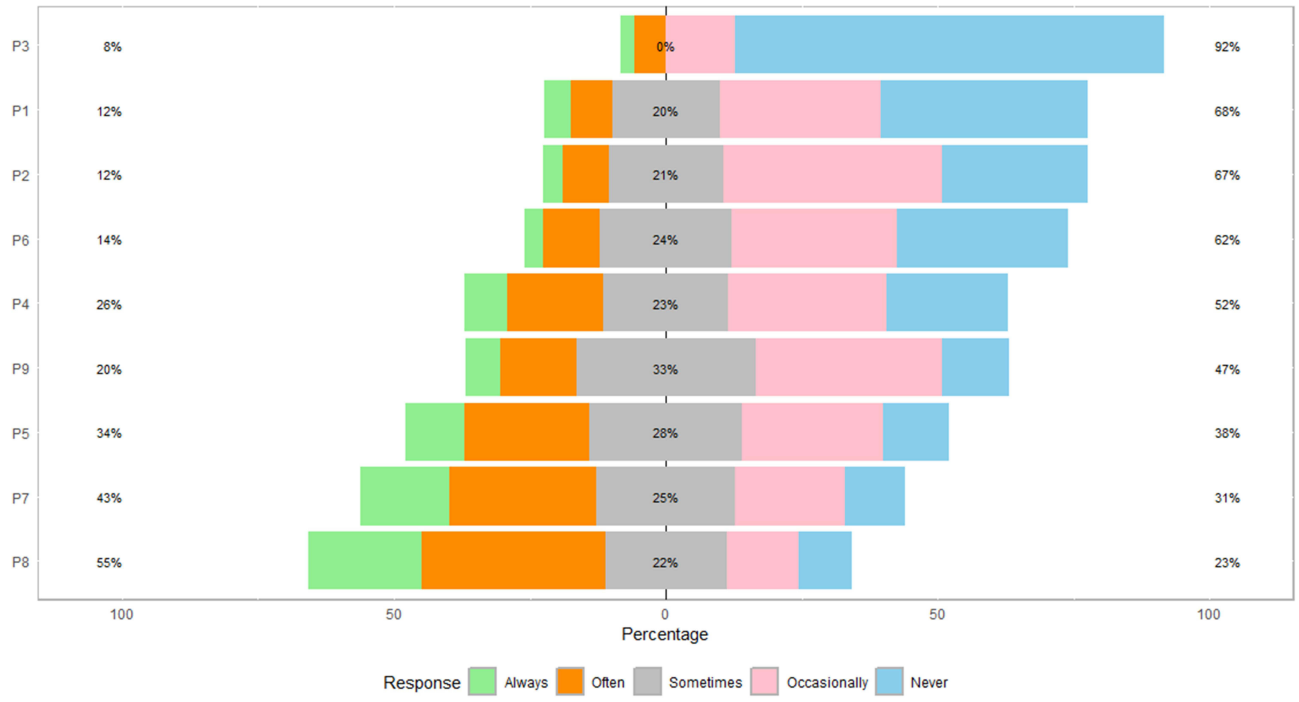

Figure 3 Practice dimension.

Pearson's Analysis

Pearson's analysis showed that knowledge was positively correlated with attitude (r=0.402, P<0.001) and practices scores (r=0.336, P<0.001), and attitude were positively correlated with the practices scores (r=0.304, P<0.001) (Table 2).

Table 2 Pearson's Analysis

	Knowledge	Attitude	Practice
Knowledge	1		
Attitude	0.402 (P<0.001)	1	
Practice	0.336 (P<0.001)	0.304 (P<0.001)	1

Structural Equation Model

The structural equation model demonstrated that knowledge had direct effects on attitudes (β=0.63, p<0.001), and practices (β=0.81, p<0.001). Moreover, attitudes had direct effects on practices (β=0.43, p<0.001) (Figure 4 and Supplementary Table 3).

Discussion

This study found that guardians of boys have insufficient knowledge, positive attitudes, but poor practices toward the CP. Guardians of children already diagnosed with CP demonstrated higher knowledge and practice scores, while participants from rural areas and those with lower income had lower knowledge scores, indicating most vulnerable populations. Findings from correlation analysis and equation modeling suggest that practice is strongly influenced by knowledge, indicating that healthcare providers should enhance parental education on CP to improve their knowledge, thereby contributing to better practice and ultimately improving the prognosis of CP.

Several studies have reported limited knowledge in young males or their parents about various genital diseases.[18–20] Similarly, the present study found inadequate knowledge about CP among guardians of boys. Surgical intervention presently stands as an efficacious therapeutic approach for the management of CP.[15] However, only 6.09% of participants in this study had a correct understanding of the necessity of surgeries in pediatric CP. Previous studies also reported that concealed penis could be a source of constant concern for both parents and children,[21] which is consistent with the majority of participants in this study who expressed worry about CP.

Despite worry, participants rarely educated their child on genital development, with few frequently noting urination abnormalities or the development and shape of their child's penis, especially among guardians of children without a CP diagnosis. These findings underscore KAP gaps concerning CP among guardians, offering insight for targeted health program and management strategy development. Healthcare providers remain the primary source of information for guardians;[22] thus, new educational strategies directed at parents/guardians of boys should include the information about CP. To alleviate the psychological distress experienced by both children and guardians, it is recommended to provide them with an understanding that

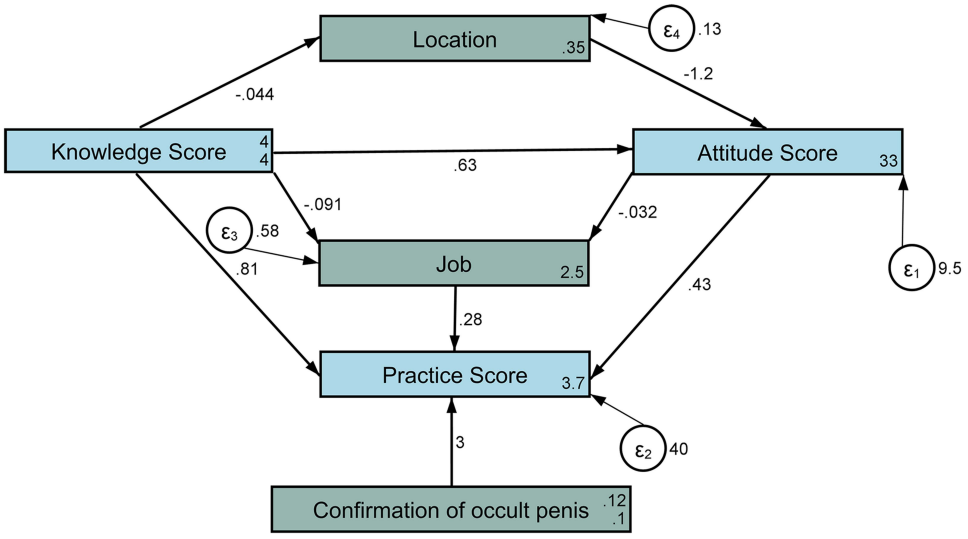

Figure 4 The structural equation model of Knowledge, Attitude, Practice.

CP is a form of atypical external genitalia presentation that can be cured through treatment to achieve a satisfactory appearance and function.[10,15] Still, parent/guardian is a critical figure in the sexual and genital education of their children that cannot be replaced by the healthcare provider.[23,24] It is beyond worrisome that most participants in this study rarely attended lectures or scientific activities related to genital health or communicated with other parents, which might explain the low knowledge score. This suggests that information about CP should be disseminated through multiple channels to reach the guardians.

Although to the best of our knowledge, no previous KAP study on this condition was conducted in China, previous pediatric studies often reported that residence and income had a notable impact on KAP scores of Chinese parents.[25,26] Moreover, it was previously noted that reproductive health in particular receives less attention in rural areas, with higher rate of misconceptions and incorrect beliefs among parents.[27] In line with that, in the present study participants from urban areas and higher income had significantly higher knowledge scores, indicating that rural parents and low income households are most vulnerable and need to be the focus of the future educational interventions.

The present study also revealed that guardians of children with CP had significantly better knowledge and practices concerning CP than guardians of children without CP, possibly because the former received prior health education on CP treatment after the diagnosis. However, awareness of congenital genital defects and genital self-examination rate in children and young males has remained low.[18] Guardians of children without a CP diagnosis might have neglected the genital development in their children, leading to the potential missed diagnosis of CP. Additionally, unemployed participants were found to have significantly lower knowledge and attitude scores than those with medical or other occupations. Therefore, extra health education programs about CP should be conducted, especially for unemployed guardians of children without CP living in rural areas.

There are several limitations in this study. First, due to the self-reported nature of the questionnaire data, participant responses may be subject to social desirability bias. Secondly, this was a single-center study particularly for guardians of children with CP. The findings of this study should be further confirmed in a multicenter study. Nonetheless, this study confirmed a positive correlation among knowledge, attitudes, and practices through Pearson correlation analysis and Structural Equation Modeling, validating the feasibility of enhancing guardians' KAP levels towards CP through tailored health education. Furthermore, this study holds both theoretical and practical implications to guide healthcare providers and policymakers in designing more effective educational programs to improve the KAP of guardians towards the management of CP and ultimately improve the prognosis of pediatric CP.

Conclusion

This study found insufficient knowledge, positive attitudes, but poor practices toward the CP in guardians of boys, especially among participants from rural areas of families with lower income. It is recommended to tailor educational initiatives and implement strategies to bridge the knowledge-practice gap toward concealed penis in boys.

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 author(s) report no conflicts of interest in this work.

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