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ORIGINAL RESEARCH

Knowledge, Attitudes, and Practices Regarding PCSK9 Inhibitors Among Healthcare Professionals: Exploring Behavioral Pathways and the Intermediary Role of Attitude

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Introduction: The aim of the current study was to assess the knowledge, attitudes, and practices (KAP) of healthcare professionals about proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors and to explicitly explore the behavioral pathways linking these domains, focusing on how attitude connects knowledge to clinical practice.

Methods: A cross-sectional study was carried out with a structured, self-complete questionnaire sent to healthcare workers of the Xuzhou area from October 2024 to July 2025. Demographic data of the respondents as well as KAP scores were obtained and compared. Knowledge, attitude, and practice interactions were analyzed with Spearman correlation and structural equation modeling.

Results: 512 usable responses for analysis. The mean scores were 10.05 ± 2.61 for knowledge, 23.78 ± 5.04 for attitude, and 31.71 ± 6.40 for practice. Knowledge, attitude, and practice were positively correlated with each other ($P < 0.001$). SEM analysis indicated that attitude was a mediator of the relationship between knowledge and practice in a full sense. Knowledge exerted a significant direct influence on attitude ($\beta = 0.873$, $P < 0.001$) and an indirect effect on practice ($\beta = 0.702$, $P = 0.005$), but the direct path from knowledge to practice was not significant statistically ($P = 0.124$).

Conclusion: Clinical practitioners demonstrated moderate levels of knowledge and self-reported practice regarding PCSK9 inhibitors that were underpinned by a generally positive attitude. Attitude was associated with practice and statistically mediated the knowledge–practice association within the proposed model. Educational activities should therefore aim not only to remedy gaps in knowledge but also to foster professional attitudes for the facilitation of the clinical use of PCSK9 inhibitors.

Keywords: PCSK9 inhibitors, knowledge, attitude, practice, healthcare professionals, structural equation model

Introduction

The emergence of proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors signifies a substantial therapeutic advance in the management of hypercholesterolemia.[1–3] These agents employ a novel mechanism that involves selectively inhibiting PCSK9, which enhances the hepatic clearance of low-density lipoprotein cholesterol (LDL-C), and results in profound, sustained reductions in circulating LDL-C levels.[4,5] When contrasted with traditional lipid-lowering agents, PCSK9 inhibitors provide superior efficacy through a distinct mode of action, presenting a significant opportunity for high-risk cardiovascular patients worldwide.[2,6,7]

While statins remain the cornerstone of lipid management, many patients encounter therapeutic challenges, including statin intolerance or failure to reach LDL-C goals despite maximal therapy.[8,9] PCSK9 inhibitors address these gaps, proving particularly valuable for patients with familial hypercholesterolemia or those at very high cardiovascular risk.[1,10,11] These populations often face a considerable residual risk for cardiovascular disease (CVD), which persists

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as a primary cause of global mortality and morbidity.[8,12] PCSK9 inhibitors offers a targeted pharmacological approach to mitigate this residual cardiovascular risk and improve long-term patient outcomes and quality of life in high-risk individuals.[6,10,13]

The effective integration of innovative treatments like PCSK9 inhibitors into clinical settings is heavily dependent on the knowledge, attitude, and practice (KAP) of healthcare professionals.[14] Healthcare professionals' understanding and acceptance of new agents directly determine treatment uptake and efficacy. However, being a relatively new class of drugs, the adoption of PCSK9 inhibitors is met with several obstacles, including high costs and insurance coverage issues, insufficient provider familiarity with their complete clinical profile, and relevant regional consensus statements, and challenges related to long-term patient engagement,[15–18] with real-world data from China indicating a 12-month adherence rate to PCSK9 monoclonal antibodies of only 31.8%.[19] Moreover, the limited applicability of Western-centric guidelines to Asian populations further complicates standardized prescription practices.[20] In regional healthcare settings such as Xuzhou, these barriers collectively contribute to a gap between clinical guidelines and actual practice.

The KAP survey model provides a structured framework for evaluating these domains to identify barriers and inform targeted interventions.[21] A critical synthesis of recent KAP studies regarding novel drug adoption reveals that knowledge deficits alone do not fully explain clinical inertia; rather, cognitive and affective domains interact in complex ways. Grounded in behavioral implementation frameworks such as the Theory of Planned Behavior, understanding how professional attitudes link objective knowledge to practical implementation is essential for designing effective interventions. To date, while recent surveys have highlighted poor guideline awareness and patient-related adherence barriers in general dyslipidemia management,[20] a comprehensive assessment of KAP specifically regarding PCSK9 inhibitors among healthcare providers is limited. More importantly, existing surveys traditionally treat KAP domains as isolated variables, leaving the specific behavioral pathways and interaction mechanisms largely unknown. This conceptual gap restricts the ability to target the precise intermediary factors driving clinical prescribing. Therefore, this study was designed to investigate the KAP of healthcare professionals (including physicians, nurses, pharmacists, and technicians) concerning PCSK9 inhibitors and their clinical use, and, to our knowledge, is one of the first surveys to specifically examine PCSK9 inhibitor-related KAP among healthcare professionals. We deliberately included a diverse multidisciplinary cohort because real-world PCSK9 inhibitor implementation requires collaborative care: prescribers initiate therapy, pharmacists navigate complex authorization and dispensing, nurses conduct essential patient education, and technicians facilitate lipid monitoring. Furthermore, we utilized structural equation modeling (SEM) to quantitatively explore the underlying structural relationships and mediating effects among knowledge, attitude, and practice, offering deeper insights into the specific behavioral pathways driving clinical application compared to standard regression models. By identifying knowledge gaps and elucidating the interplay between KAP domains, this research aims to provide an empirical basis for targeted educational interventions that promote the standardized clinical application of PCSK9 inhibitors.

Materials and Methods

Study Design and Participants

This multicenter, cross-sectional survey was conducted from October 1, 2024, to July 1, 2025, among healthcare professionals in the Xuzhou region. The inclusion criteria were: 1. Age (30–65 years old); 2. Professional category: Medical staff such as cardiologists, endocrinologists, neurologists, and general practitioners who may prescribe PCSK9 inhibitors; 3. Pharmacists (especially clinical pharmacists) or nursing staff (such as specialist nurses); 4. Participated in lipid management for patients with ASCVD (atherosclerotic cardiovascular disease) or familial hypercholesterolemia within the past 1 year; 5. Have prescribed or managed PCSK9 inhibitors (such as Evolocumab, Alirocumab); 6. Voluntarily participated in the survey and signed the informed consent. The target sample size was justified based on SEM requirements, which recommend 10 to 20 cases per observed variable. With 22 observed items in our KAP domains, a minimum sample size of 220 to 440 was required; thus, our final sample of 512 valid questionnaires provided sufficient statistical power.

The Exclusion Criteria Were

1. Non-clinical position medical staff (such as administrative personnel); 2. Without the prescription authority for lipid-lowering drugs or relevant patient management experience (such as only engaged in basic research); 3. Recently (within 3 months) participated in similar investigations to avoid response bias due to repetition; 4. Questionnaire incomplete (such as unanswered key questions) or logically inconsistent (such as "never used PCSK9 inhibitors" but chose "prescribe more than 10 cases per month"). The study protocol was approved by the Ethics Committee of Xuzhou First People's Hospital, and written informed consent was obtained from all participants before completing the survey.

Questionnaire

The survey instrument was developed based on a review of existing literature and relevant clinical guidelines,[15–17] and its content was validated by an expert panel. A pilot test was conducted with a small sample of healthcare professionals to ensure the clarity and appropriateness of the questions. The final Chinese version demonstrated good internal consistency, with a Cronbach's α coefficient of 0.905. Sampling adequacy was confirmed with Kaiser-Meyer-Olkin (KMO) = 0.956 and significant Bartlett's test of sphericity ($P < 0.001$). Besides, a confirmatory factor analysis (CFA) was conducted to validate the measurement model's factor structure, with fit indices and factor loadings detailed in Supplementary Tables 1–2 and Supplementary Figure 1.

The four components of the survey were:

1. Demographic Details: Included questions about gender, age, education, professional designation, department, function, years of practice, type of hospital, and prior research experience.
2. Knowledge Domain: Consisted of 8 items assessing experience with PCSK9 inhibitors' action, indications, and clinical use. These were scored on a 3-point Likert scale ("Very familiar" = 2, "Heard of it" = 1, "Unfamiliar" = 0), with the highest attainable score being 0–16. An attention-check item was embedded in the knowledge domain for data quality control and was excluded from the final knowledge score calculation.
3. Attitude Domain: Consisted of 6 items scored on a 5-point Likert scale ("Strongly disagree" = 1 to "Strongly agree" = 5) with scores ranging from 6 to 30.
4. Practice Domain: Consisted of 8 items scored on a 5-point Likert scale ("Never" = 1 to "Always" = 5) with scores ranging from 8 to 40. Additionally, several multiple-response questions were included strictly for descriptive baseline profiling; these items were not assigned numerical scores and were excluded from all quantitative domain score calculations and downstream analyses.

The questionnaire was distributed electronically via a QR code generated on the Wenjuanxing platform and shared through WeChat. To ensure data quality, each IP address was limited to one submission, all questions were mandatory, and submissions completed in under 90 seconds were excluded.

Statistical Analysis

SPSS software version 27.0 and AMOS software version 26.0 were used for analysis. Descriptive statistics were used to summarize participant demographics and KAP scores. Continuous variables were presented as mean ± SD, and categorical variables as frequencies and percentages (n, %). Mann–Whitney U and Kruskal–Wallis H one-way nonparametric tests were used to compare scores of KAP between demographic subgroups. Additionally, to evaluate the impact of prior research experience, the Pearson Chi-square test and Mann–Whitney *U*-test were applied to compare categorical demographic characteristics and continuous KAP scores, respectively, between participants with and without prior involvement in PCSK9 inhibitor-related research. Spearman rank correlation was utilized to examine correlations among total scores of practice, attitude, and knowledge. Binary logistic regression analyses were performed to identify predictors of a higher practice level. For this analysis, the practice score was dichotomized using a strict 80% cutoff of the maximum score,[22] where a score >32 designated a higher level of practice and a score ≤32 designated a lower level of practice. A SEM was constructed to test the theorized relationship between practice, attitude, and knowledge. A P-value of <0.05 (two-tailed) was considered statistically significant for all tests.

Results

Demographic Characteristics

514 questionnaires were returned initially. Two questionnaires that took less than 90 seconds to complete were not analyzed. The final sample was 512 valid questionnaires. The majority of participants were female (62.7%) and aged 32 years or younger (59.38%). Physicians were the most represented professional group (42.38%), followed by nurses (29.69%). Subgroup analysis revealed a statistically significant difference in practice score by level of education (P = 0.042) with Master's degree recipients reporting higher practice scores than those with a Bachelor's degree or below (Table 1).

Table 1 Baseline Characteristics of Participants and KAP Scores

Variables	N (%)	Knowledge, Mean ± SD	*P*	Attitude, Mean ± SD	*P*	Practice, Mean ± SD	*P*
N=512		10.05 ± 2.61		23.78 ± 5.04		31.71 ± 6.40	
Respondent Gender			0.850		0.933		0.575
Male	191 (37.30)	9.97 ± 2.80		23.76 ± 5.21		31.55 ± 6.40	
Female	321 (62.70)	10.09 ± 2.50		23.79 ± 4.94		31.80 ± 6.41	
Age			0.188		0.648		0.476
≤ 32 years	304 (59.38)	9.88 ± 2.50		23.71 ± 5.17		31.52 ± 6.47	
>32 years	208 (40.63)	10.28 ± 2.76		23.87 ± 4.84		31.98 ± 6.30	
Education Level			0.824		0.715		0.042
Bachelor's degree or below	184 (35.94)	9.92 ± 2.65		23.51 ± 5.27		30.88 ± 6.95	
Master's degree	244 (47.66)	10.07 ± 2.69		23.91 ± 5.03		32.32 ± 5.97	
Doctoral degree	84 (16.41)	10.25 ± 2.30		23.99 ± 4.52		31.77 ± 6.22	
Professional Title			0.427		0.261		0.126
Junior	36 (7.03)	9.89 ± 2.40		24.28 ± 4.32		31.92 ± 4.32	
Intermediate	189 (36.91)	10.07 ± 2.40		24.18 ± 4.63		32.26 ± 5.69	
Associate Senior	202 (39.45)	9.86 ± 2.69		23.04 ± 5.62		30.97 ± 7.13	
Senior	63 (12.30)	10.67 ± 2.86		24.81 ± 4.05		32.86 ± 6.00	
No professional title	22 (4.30)	10.00 ± 3.19		23.27 ± 5.71		30.09 ± 8.21	
Department			0.881		0.468		0.436
Neurology	204 (39.84)	10.07 ± 2.58		23.92 ± 4.96		31.83 ± 6.52	
Cardiology	161 (31.45)	9.96 ± 2.87		23.26 ± 5.47		31.13 ± 6.79	
General Practice	147 (28.71)	10.11 ± 2.37		24.14 ± 4.62		32.18 ± 5.76	
Position			0.131		0.427		0.189
Physician	217 (42.38)	10.29 ± 2.50		24.14 ± 4.65		32.08 ± 5.96	
Nurse	152 (29.69)	9.58 ± 3.00		22.96 ± 5.67		30.53 ± 7.40	
Technician	46 (8.98)	10.65 ± 1.92		24.24 ± 4.38		32.54 ± 5.63	
Pharmacist	97 (18.95)	9.96 ± 2.41		24.02 ± 5.03		32.32 ± 5.82	
Years in Practice			0.328		0.549		0.710
Less than 1 year	98 (19.14)	9.74 ± 2.56		23.96 ± 5.21		31.89 ± 6.36	
1–5 years	210 (41.02)	9.99 ± 2.55		23.65 ± 5.18		31.39 ± 6.52	
More than 6 years	204 (39.84)	10.25 ± 2.69		23.81 ± 4.82		31.95 ± 6.31	
Hospital Classification			0.050		0.292		0.563
Primary-level public hospital	120 (23.44)	9.62 ± 2.46		23.35 ± 5.00		31.66 ± 6.48	
Secondary-level public hospital	148 (28.91)	10.08 ± 2.54		23.86 ± 5.14		31.91 ± 6.43	
Tertiary-level public hospital	114 (22.27)	10.55 ± 2.98		23.75 ± 5.16		31.49 ± 6.42	
Specialized hospital	49 (9.57)	10.22 ± 2.26		24.78 ± 4.45		32.65 ± 5.76	
Private medical institution	81 (15.82)	9.80 ± 2.53		23.68 ± 5.06		31.16 ± 6.64	
Participation in PCSK9 Inhibitor-Related Research Projects			0.799		0.858		0.484
Yes	340 (66.41)	10.02 ± 2.58		23.79 ± 4.99		31.61 ± 6.34	
No	172 (33.59)	10.10 ± 2.69		23.74 ± 5.13		31.91 ± 6.52	

Notes: Data are presented as mean ± SD or n (%). SD: Standard Deviation. P-values were derived from the Mann–Whitney *U*-test or Kruskal–Wallis *H*-test, as appropriate. Statistical significance was set at P < 0.05.

Furthermore, an additional subgroup analysis revealed no significant differences in Knowledge (P=0.799), Attitude (P=0.858), or Practice (P=0.484) scores between respondents who had previously participated in PCSK9 inhibitor-related research and those who had not. Demographic variables were also highly comparable between these two groups, with the only significant difference observed in Professional Title distribution (P=0.008) (Supplementary Table 3).

KAP Domains

The KAP scores were 10.05 ± 2.61 for knowledge, 23.78 ± 5.04 for attitude, and 31.71 ± 6.40 for practice. For the knowledge domain, a notable trend was observed where for most questions, the highest percentage of respondents selected "Heard of it" as opposed to "Very familiar.". For example, for mechanism of action, 46.68% were "Heard of it" only. The highest degree of familiarity was regarding general use indication when statins are insufficient (44.53% "Very familiar"). For attitudes, responses indicated a generally positive but cautious perspective. While 71.68% agreed or strongly agreed that professionals had faith in the safety and efficacy of these medicines, many also identified significant barriers. "High cost" was cited by 60.94% as the most important one, and 73.83% agreed or strongly agreed that existing clinical guidelines must be more explicitly defined. This reflects a rational paradox where positive clinical attitudes are tempered by pragmatic and systemic challenges. Within the practice domain, self-reported actions indicated a potential gap between the performance of individual patient tasks and engagement in collaborative, team-based activities. A greated proportion of respondents indicated "Always" performing independent tasks such as actively monitoring for side effects (46.88% "Always") and checking cholesterol levels at regular intervals (42.38% "Always"). In contrast, collaborative tasks, such as attending to multidisciplinary discussions before initiating therapy, however, were reportedly performed "Always" by a smaller percentage of professionals (41.6%) (Supplementary Table 4).

Spearman Correlation Analysis

Spearman correlation analysis revealed that there were significant positive correlations between all three KAP domains. The strongest correlation was that between attitude and practice ($r = 0.571$, $P < 0.001$), followed by knowledge and practice ($r = 0.384$, $P < 0.001$), and knowledge and attitude ($r = 0.348$, $P < 0.001$) (Table 2).

Multivariate Logistic Regression Analyses

Based on cutoff of 80% of the maximum possible score, 327 participants were classified as having a higher level of practice, whereas 185 were classified as having a lower level of practice. Univariate and multivariate logistic regression analyses found that increased scores for Knowledge (OR = 1.468, $P < 0.001$) and Attitude (OR = 1.434, $P < 0.001$) in the univariate analysis were positively associated with the higher level of practice (defined as a score >32). No demographic or professional factors were found to be significant predictors. For the multivariate analysis below, both Attitude and Knowledge scores were significant independent predictors of practice level. Specifically, higher Knowledge score (OR = 1.213, $P < 0.001$) and positive Attitude score (OR = 1.393, $P < 0.001$) independently increased the odds of a high practice score (Table 3).

Table 2 Spearman Correlation Matrix for KAP Scores

	Knowledge	Attitude	Practice
Knowledge	1.000		
Attitude	0.348**	1.000	
Practice	0.384**	0.571**	1.000

Notes: **P < 0.01. Values represent Spearman's rank correlation coefficients (ρ). Sample size n = 512.

Table 3 Univariate and Multivariate Analysis

	Univariate Logistic Regression		Multivariate Logistic Regression	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**
Knowledge Score	1.468 (1.342–1.605)	<0.001	1.213 (1.087–1.354)	<0.001
Attitude Score	1.434 (1.332–1.545)	<0.001	1.393 (1.289–1.506)	<0.001
Respondent Gender				
Male	0.931 (0.642–1.350)	0.706		
Female	ref			
Age				
≤ 32 years	0.960 (0.665–1.387)	0.829		
>32 years	ref			
Education Level				
Bachelor's degree or below	ref			
Master's degree	1.464 (0.983–2.181)	0.061		
Doctoral degree	1.118 (0.658–1.899)	0.679		
Professional Title				
Junior	0.865 (0.296–2.534)	0.792		
Intermediate	1.418 (0.575–3.497)	0.448		
Associate Senior	1.056 (0.431–2.585)	0.905		
Senior	1.731 (0.630–4.754)	0.287		
No professional title	ref			
Department				
Neurology	1.170 (0.751–1.821)	0.488		
Cardiology	0.980 (0.618–1.555)	0.932		
General Practice	ref			
Position				
Physician	ref			
Nurse	0.717 (0.469–1.096)	0.124		
Technician	1.750 (0.841–3.640)	0.134		
Pharmacist	1.171 (0.704–1.949)	0.544		
Years in Practice				
Less than 1 year	ref			
1–5 years	0.772 (0.466–1.280)	0.316		
More than 6 years	0.889 (0.533–1.481)	0.651		
Hospital Classification				
Primary-level public hospital	1.213 (0.677–2.171)	0.516		
Secondary-level public hospital	1.242 (0.710–2.174)	0.448		
Tertiary-level public hospital	1.001 (0.559–1.793)	0.996		
Specialized hospital	1.480 (0.697–3.144)	0.308		
Private medical institution	ref			
Participation in PCSK9 Inhibitor-Related Research Projects				
Yes	0.853 (0.581–1.254)	0.419		
No	ref			

Structural Equation Modeling

The fit indices for the proposed SEM, indicated a good fit to the data (CMIN/DF = 1.223, RMSEA = 0.021, CFI = 0.986) (Supplementary Table 5). The standardized path coefficients are shown in. The model indicated that knowledge had a significant positive direct effect on attitude ($\beta = 0.873$, $P < 0.001$). Attitude had a significant positive direct effect on practice ($\beta = 0.803$, $P < 0.001$), whereas knowledge did not. The direct effect from knowledge to practice was not statistically significance ($\beta = 0.212$, $P = 0.124$). However, knowledge had a significant indirect effect on practice through the statistical intermediary role of attitude (Standardized indirect effect $\beta = 0.702$, $P = 0.005$) (Figure 1 and Table 4).

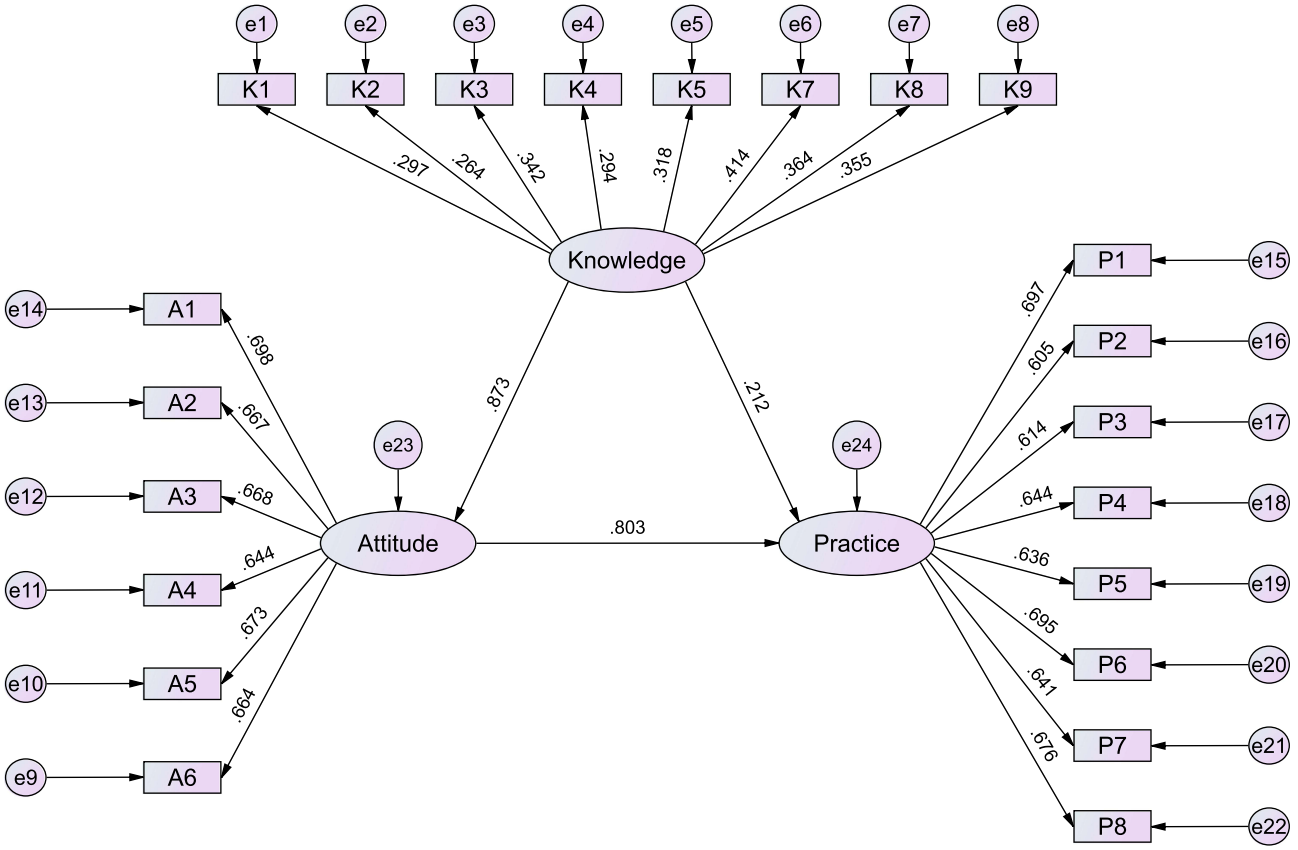

Figure 1 Structural Equation Model of Knowledge, Attitude and Practice.

Discussion

The current research is a systematic analysis of knowledge, attitude, and practice of healthcare professionals toward PCSK9 inhibitors, applying SEM to describe the complex interaction among these constructs. Our main result is that professional attitude might mediate the associations between knowledge and clinical practice, showing that only being knowledgeable is insufficient for fostering its use without the presence of a good professional attitude.

Our results, indicating moderate levels of knowledge with favorable but cautious and pragmatic attitudes, are consistent with existing literature on the uptake of other novel medical therapies.[23] That the majority of professionals had only "heard of" salient features of PCSK9 inhibitors is a common pattern seen when a medical innovation is first diffusing. For instance, a study of DOACs knowledge among pharmacists revealed precisely the same knowledge gaps, primarily in terms of dosing modification and monitoring algorithms.[24] This suggests a superficial level of awareness rather than in-depth knowledge regarding PCSK9 inhibitors among most respondents. Such limited deep mastery is particularly critical given the substantial vascular benefits of adding high-intensity lipid-lowering therapies like PCSK9

Table 4 Sem

Model Paths	Standardized Total Effects		Standardized Direct Effects		Standardized Indirect Effects	
	β (95% CI)	P	β (95% CI)	P	β (95% CI)	P
Knowledge→Attitude	0.873 (0.769–0.947)	0.011	0.873 (0.769–0.947)	0.011		
Knowledge→Practice	0.914 (0.824–1.001)	0.007	0.212 (−0.219–0.550)	0.210		
Attitude→Practice	0.803 (0.475–1.179)	0.009	0.803 (0.475–1.179)	0.009		
Knowledge→Practice					0.702 (0.453–1.284)	0.005

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inhibitors in atherosclerotic patients, particularly in promoting vulnerable plaque stabilization and atheroma regression,[25] which highlights the urgent need to bridge the gap between clinical efficacy and provider awareness. Likewise, supported by our result that 71.68% of respondents agreed on the safety and efficacy of these agents, clinical effectiveness is highly valued by professionals, although this is tempered by concerns for undue cost. Furthermore, it is important to acknowledge that the uptake of innovative new products is not solely dependent on provider KAP. It is also significantly influenced by the active role of pharmaceutical manufacturers in providing continuing medical education, facilitating patient access programs, and encouraging clinical adoption—external drivers that warrant consideration in real-world settings. A qualitative study examining PCSK9 inhibitor prescribing obstacles in the US identified cost and rigorous insurance authorization processes as the prevailing discouragement to cardiologists, even when believing the drugs were clinically suitable.[26,27] This suggests that the tension among perceived clinical value and economic limitation is a system issue insinuating the take-up of expensive, new drugs in many healthcare systems.[28,29]

Moreover, the extreme positive correlation reported between KAP dimensions and the mediating effect of attitude provide empirical evidence for the theoretical KAP model of new drug adoption. This concurs with findings of a study on antimicrobial stewardship that also highlighted the importance of professional attitude in bringing about the translation of knowledge into appropriate prescribing habits.[29,30] Nevertheless, although professional experience has been correlated with improved attitudes and practices in some research, such as the study on the working environment of pediatric nurses,[31] our research did not establish a high correlation between years of practice and KAP scores. This could mean that with such a highly specialized and fast-evolving therapy as PCSK9 inhibitors, regular education and CME may prove stronger than just total years of practice.[32] Experienced clinicians would become more familiar with habitual statin-driven regimens, while recent trainees would be better tuned into fresh evidence-based guidelines incorporating new drugs.[33]

Furthermore, it is important to clarify the apparent methodological distinction between our regression and SEM findings. While knowledge emerged as a significant independent predictor of practice in the multivariate logistic regression, its direct path became non-significant within the structural equation model. This occurs because logistic regression evaluates the overall association, whereas SEM partitions these structural pathways. The loss of direct significance in SEM indicates full statistical mediation, suggesting that the impact of knowledge on clinical practice is primarily actualized through the formation of appropriate professional attitudes.

The inference that attitude fully mediates the relationship between knowledge and practice has extremely robust policy and educational intervention implications. Presenting raw facts with traditional didactic methods is unlikely to change clinical practice. What emerges from our study is the need for interventions to also aim at the attitudinal domain, shaping the perception, beliefs, and professional horizon of healthcare professionals. For example, educational programs could move from simple knowledge transfer to more complex, case-based scenarios in which clinicians have to go through the very problems (eg., cost, guideline ambiguity) they had reported were barriers.[34] Workshops and continuing education emphasizing the practical value proposition of PCSK9 inhibitors in high-risk patients can prompt a bolder professional response.[35] Support from institutions also is critical. Healthcare systems may encourage good attitudes by establishing streamlined prior authorization procedures, clear institutional guidelines, and making decision-support tools within electronic health records available to reduce administrative burdens and inspire prescribing these drugs.[36,37]

Regarding the demographic profile of our cohort, it is noteworthy that while physicians comprised the largest professional group (42.38%), only 16.41% of the total sample held a doctoral degree. This distribution accurately reflects the current multi-tiered medical education system in China. Unlike healthcare systems where a doctoral degree (M.D. or Ph.D.) is a universal prerequisite for medical practice, the primary pathways for clinical licensure in China are the 5-year bachelor's program and the "5+3" integrated master's program. Consequently, doctoral degrees are predominantly pursued by clinician-scientists in elite academic centers, whereas the vast majority of frontline patient care across regional and secondary hospitals is delivered by highly experienced practitioners holding bachelor's or master's degrees.[38] Therefore, our sample closely aligns with the real-world clinical workforce demographic in regional settings like Xuzhou.

This research has some limitations that have to be stated initially. Firstly, the cross-sectional design prevents the setting up of causal associations, and secondly, self-report questionnaire data may create bias through social desirability and recall bias,[39] which may not reflect objective, real-world prescribing behaviors; thirdly, the regional convenience sampling from one area in China (Xuzhou) restricts generalizability to actual prescribers in other healthcare systems or cultures;[40] fourthly, multi-center cross-validation of the questionnaire remains incomplete, and quantitative assessments of content validity, such as a Content Validity Index (CVI), were not formally performed prior to implementation.

Conclusion

Our regional, cross-sectional study demonstrates that knowledge, attitudes, and self-reported practices regarding PCSK9 inhibitors were positively associated among healthcare workers in the Xuzhou area, with attitude showing a statistically important intermediary role in the proposed SEM. Rather than acting as a definitive causal factor, appropriate professional attitude serves as a vital statistical link between knowledge and self-reported actions. Future initiatives to make optimal use of these potent lipid-lowering drugs need to adopt a twofold approach, which not only disseminates technical knowledge but also establishes desirable professional mindsets and transcends perceived barriers to care.

Data Sharing Statement

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

Ethics Approval and Consent to Participate

This study was approved by the Ethics Review Committee of the First People's Hospital of Xuzhou City (xyyl1[2024] 073), 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 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

All authors declare that they have no conflicts of interest in this work.

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