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ORIGINAL RESEARCH

Knowledge, Attitudes and Practices Toward Hypotension During Hemodialysis Among Nephrology and Hemodialysis Medical Staff: A Multi-Center Cross-Sectional Study

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Objective: To explore the knowledge, attitudes, and practices (KAP) of nephrology and hemodialysis medical staff regarding hypotension in hemodialysis patients.

Methods: This cross-sectional study was conducted between March and May 2024 across nine hospitals in China. The KAP scores were collected using a structured questionnaire including demographic characteristics, knowledge, attitudes, and practices.

Results: The study cohort consisted of 205 medical staff [169 (82.44%) female], included 55 nephrologists or physicians (26.83%), 131 nurses (63.90%), and 19 related medical technicians (9.27%). The mean scores for knowledge, attitudes, and practices were 15.47 ± 5.08 (possible range: 0–20), 45.44 ± 4.41 (possible range: 10–50), and 28.80 ± 5.53 (possible range: 7–35), respectively. Spearman correlation analysis revealed significant positive relationships between knowledge and attitude ($r = 0.283$, $P < 0.001$), knowledge and practice ($r = 0.605$, $P < 0.001$), and attitude and practice ($r = 0.486$, $P < 0.001$). Path analysis showed that knowledge ($\beta = 0.439$, $P < 0.001$), attitudes ($\beta = 0.330$, $P < 0.001$), current department ($\beta = -0.947$, $P = 0.025$) and experience of participating in literature related to hypotension during hemodialysis ($\beta = 1.769$, $P = 0.004$) had effects on practice.

Conclusion: Medical staff in this study demonstrated generally adequate levels of knowledge, attitudes, and practices concerning hypotension management in hemodialysis patients. Ongoing professional development and targeted educational interventions are recommended to further enhance the competency of healthcare providers in managing hypotension among hemodialysis patients.

Keywords: cross-sectional study, hemodialysis, hypotension, knowledge, attitudes, practices, medical staff

Introduction

The prevalence of hemodialysis patients in China has seen a substantial increase, rising from 174.1 per million population (PMP) in 2011 to 379.1 PMP in 2017.[1] In 2021, over 540,000 patients in the United States underwent maintenance hemodialysis or peritoneal dialysis for the treatment of chronic kidney failure.[2] This growth highlights the mounting burden of kidney disease requiring dialysis and emphasizes the importance of comprehensive, multidisciplinary care. Managing chronic hemodialysis necessitates collaboration among medical staff, including nephrologists, nurses, dietitians, and technicians, who each play vital roles in ensuring effective and safe treatment outcomes. Intradialytic hypotension, a common and challenging complication during hemodialysis, is defined as a reduction in systolic blood pressure of at least 20 mmHg. This condition is often accompanied by symptoms such as cramps, dizziness, headaches, and nausea.[3] Studies indicate that approximately 75% of patients undergoing maintenance hemodialysis experience at least one episode of hypotension per session. Moreover, intradialytic hypotension occurs in 20–30% of all hemodialysis

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treatments.[4] This condition is associated with severe outcomes, including cardiovascular mortality, patient-reported symptoms, inadequate dialysis, end-organ ischemia, vascular access thrombosis, and increased overall mortality.[5]

The Knowledge-Attitude-Practice (KAP) model, foundational in health literacy, posits that knowledge positively influences attitudes, which subsequently inform individual practices.[6,7] This model is essential for evaluating healthcare professionals' preparedness to identify, prevent, and manage clinical challenges such as hypotension during hemodialysis.[8] Medical staff are pivotal in mitigating this complication through vigilant patient monitoring, timely interventions, and adherence to evidence-based protocols.

Despite its clinical importance, there is a lack of detailed understanding of the current KAP levels among healthcare providers in China regarding hypotension management during hemodialysis. This multi-center cross-sectional study aims to address this gap by examining the knowledge, attitudes, and practices of nephrology and hemodialysis medical staff, including nephrologists, nurses, and medical technicians, in managing this condition. The findings will provide insights for developing targeted educational and training programs to enhance the quality and safety of patient care.[9]

Methods

Study Design and Subjects

This cross-sectional study enrolled nephrology and hemodialysis medical staff between March and May 2024 across multiple hospitals in China, including the Affiliated Hospital of Chengdu University of Traditional Chinese Medicine, Jiangyou People's Hospital, Pengzhou Hospital of Traditional Chinese Medicine, Luzhou People's Hospital, Longhua Hospital Affiliated to Shanghai University of Traditional Chinese Medicine, Sichuan Provincial People's Hospital, Shenzhen Hospital of Guangzhou University of Traditional Chinese Medicine, Yibin Mine Emergency Hospital, and Jiangsu Provincial Hospital of Traditional Chinese Medicine. Participants were recruited through internal announcements and emails within the participating hospitals. Only medical staff directly involved in the care of hemodialysis patients were eligible for the study. Informed consent was obtained from all participants when they accessed the electronic survey link.

Sample Size Calculation

The required sample size was calculated using the "5–10 times EPV (Events Per Variable)" principle, which is commonly applied in structural equation modeling and similar analyses. In this study, the structural model included 10 observed variables (eg, knowledge, attitude, practice, age, department, etc). Based on this principle, a minimum of 50–100 participants was required. Considering potential missing data and invalid responses, we aimed to recruit at least 200 participants.

Questionnaire introduction

The questionnaire was developed referencing guidelines and literature identified as relevant to the study's focus.[10] It underwent iterative revisions based on inputs from senior-level experts, and its reliability was evaluated through a pilot study involving 34 participants, which yielded a reliability coefficient of 0.923. The questionnaire included trap questions, such as "The capital of China is Shanghai", to identify inattentive or careless respondents. Responses to these questions were used to validate attentiveness, and invalid responses were excluded from the analysis.

The final version of the questionnaire, presented in Chinese, encompasses four sections: demographic information, knowledge, attitude, and practice. The definition of intradialytic hypotension has been explicitly stated in the Questionnaire introduction section as a decrease in systolic blood pressure of ≥20 mmHg (1 mmHg = 0.133 kPa) or a reduction in mean arterial pressure of more than 10 mmHg, accompanied by symptoms of hypotension according to the Expert consensus on the prevention and treatment of intradialytic hypotension (2022).[10] The knowledge section comprises 10 questions, scored as follows: 2 points for a correct and detailed answer, 1 point for a basic understanding, and 0 points for incorrect or no knowledge, with a total possible score ranging from 0 to 20 points. The attitude section also includes 10 items, utilizing a five-point Likert scale from strongly agree (5 points) to strongly disagree (1 point), allowing for a total score between 10 and 50 points. The practice section consists of 7 questions, scored on a five-point scale from always (5 points) to never (1 point), with the total scoring range from 7 to 35 points. A score above 70% of the maximum possible in each dimension is considered indicative of adequate knowledge, a positive attitude, and

proactive practice.[11] Participants were recruited via WeChat by sharing a QR code (using *Wenjuanxing* platform: https://www.wjx.cn/) with department heads or nurse managers of nephrology or hemodialysis units in various hospitals. They then distributed the survey to the physicians and nurses in their respective departments.

Statistical Analysis

Data analysis was conducted using SPSS 27.0 and AMOS 26.0 software. Missing data were handled by excluding incomplete responses based on predefined criteria. The following responses were excluded: (1) 2 participants disagreed to participate; (2) 1 participant entered "female" as the age; and (3) 3 participants failed the trap questions. Duplicate responses were controlled using unique identifiers assigned to each participant. To ensure data security, all responses were securely stored on a password-protected server, and access was restricted to authorized personnel. Anonymization of responses was performed prior to analysis to ensure blinded statistical assessment. Continuous data with a normal distribution were expressed as mean ± standard deviations (SD) and analyzed using Student's *t*-test, otherwise, they were presented as medians (interquartile range, IQR) and analyzed using the Mann–Whitney *U*-test. Categorical data were presented as n (%) and analyzed using the chi-square test or Fisher's exact test. All data were securely stored on a password-protected server, and responses were anonymized before analysis to ensure blinding. Spearman correlation analysis was used to analyze the correlations between Knowledge, Attitude and Practice dimensions. The reliability analysis was performed separately for doctors and nurses, yielding Cronbach's α coefficients of 0.927 and 0.923, respectively. Univariate and multivariate logistic regression analyses were performed, with the practice dimension having a cutoff value of 80%. Variables with a P-value less than 0.05 in the univariate analysis were included in the multivariate analysis. Path analysis was performed to determine the relationships among Knowledge, Attitude and Practice dimensions. Two-sided P-values < 0.05 were considered statistically significant.

Result

Demographic Characteristics

A total of 205 participants were enrolled, 169 (82.44%) were female, with an average age of 34.04 ± 7.98 years. A total of 131 (63.90%) were nurses, 55 (26.83%) were nephrologists or physicians, 19 (9.27%) were related medical technicians, and 99 (48.29%) worked in the hemodialysis department. Furthermore, 174 (84.88%) had managed patients experiencing hypotension during hemodialysis, 86 (41.95%) had managed over 50 cases, and 51 (24.88%) had participated in relevant projects. The mean scores for knowledge, attitudes, and practices were 15.47 ± 5.08 (possible range: 0–20), 45.44 ± 4.41 (possible range: 10–50), and 28.80 ± 5.53 (possible range: 7–35), respectively. It is important to note that each KAP domain utilized different scales to measure outcomes. Knowledge scores ranged from 0 to 20, attitude scores from 10 to 50, and practice scores from 7 to 35, reflecting varying levels of detail and response options. For instance, the attitude and practice sections employed Likert scales with neutral categories, while the knowledge section relied on binary or short-response answers. This methodological approach is consistent with similar KAP studies[11–13] (Table 1).

Knowledge, Attitudes and Practices Dimensions

The distribution of knowledge responses revealed that the highest percentages of participants selecting "Unclear" were observed for the following statements: "The straight leg raising test can be considered as a treatment option for hypotension during dialysis" (K11) at 19.02%, "Hypotension during dialysis can lead to inadequate perfusion of the central nervous system, potentially resulting in conditions like cerebral ischemia and frontal lobe atrophy" (K8) at 11.22%, and "The occurrence of hypotension during hemodialysis is related to the patient's age, gender, and duration of dialysis" (K3) at 8.29% (Table S1). Attitudinal responses highlighted neutrality (14.63%) and disagreement (6.34%) regarding the need to enhance medical staff awareness of hypotension in hemodialysis (A3). Neutrality (14.15%) and perceived insufficiency (2.44%) were also noted concerning the adequacy of training and guidelines for managing hypotension in dialysis patients (A6). Regarding confidence in managing such patients (A8), 13.17% were neutral and 0.98% expressed lack of confidence (Table S1). In practice dimensions, 8.29% rarely and 2.44% never followed or studied the latest literature and guidelines (P5), 4.39% rarely and 2.44% were unable to accurately diagnose hypotension

Table 1 Demographic Characteristics

Variables	N (%)	Knowledge	*P*	Attitude	*P*	Practice	*P*
N=205							
Total score		15.47±5.08		45.44±4.41		28.80±5.53	
Gender			0.982		0.415		0.968
Male	36 (17.56)	15.31±5.22		45.69±4.99		27.81±7.84	
Female	169 (82.44)	15.51±5.06		45.38±4.29		29.01±4.90	
Age	34.04±7.98		0.006		0.803		0.106
Age ≤ 32	104 (50.73)	14.70±5.10		45.51±4.07		28.35±5.44	
Age > 32	101 (49.27)	16.27±4.96		45.37±4.75		29.27±5.61	
Work experience			0.005		0.686		0.923
≤5 years	51 (24.88)	13.43±5.41		45.45±3.81		29.25±4.51	
More than 5 years, less than 10 years	53 (25.85)	16.34±3.91		45.15±4.28		28.70±4.84	
More than 10 years, less than 15 years	46 (22.44)	16.17±5.36		45.13±5.34		28.24±7.01	
≥15 years	55 (26.83)	15.95±5.13		45.96±4.25		28.95±5.71	
Occupation			0.007		0.099		0.001
Physician	55 (26.83)	16.36±4.30		45.95±4.24		30.38±5.19	
Nurse	131 (63.90)	15.90±4.36		45.56±4.25		28.92±4.38	
Medical technicians	19 (9.27)	9.95±7.98		43.11±5.39		23.42±9.43	
Professional title			<0.001		0.704		0.337
Junior	89 (43.41)	14.34±5.40		45.49±4.13		27.93±6.45	
Intermediate	80 (39.02)	16.79±3.84		45.44±4.70		29.50±4.59	
Senior or chief	23 (11.22)	18.43±3.00		45.78±4.80		30.30±3.69	
No professional title	13 (6.34)	9.92±6.30		44.46±4.05		27.77±6.08	
Department			<0.001		0.672		<0.001
Nephrology	76 (37.07)	15.50±4.77		45.66±4.02		29.96±4.51	
Hemodialysis	99 (48.29)	17.62±2.70		45.72±3.88		29.76±3.77	
Other	30 (14.63)	8.33±5.44		43.97±6.42		22.70±8.31	
Hospital type			0.613		0.251		0.286
Tertiary Grade A	163 (79.51)	15.28±5.35		45.21±4.41		28.53±5.54	
Tertiary Grade B	38 (18.54)	16.18±3.91		46.29±4.48		29.79±5.61	
Other	4 (1.95)	16.50±3.51		46.75±3.30		30.50±3.32	
Have you ever treated patients with hypotension during hemodialysis in clinical practice?			<0.001		0.169		<0.001
Yes	174 (84.88)	16.93±3.50		45.71±4.07		29.95±3.95	
No	31 (15.12)	7.32±4.88		43.94±5.84		22.35±8.20	
How many patients with hypotension in hemodialysis have been treated in your clinical work?			<0.001		0.022		0.110
Less than 10 cases	33 (16.10)	14.64±4.47		45.85±4.23		29.55±4.60	
10–30 cases	37 (18.05)	15.70±3.89		45.11±4.68		28.68±3.92	
30–50 cases	18 (8.78)	16.39±3.29		43.33±3.56		29.89±3.20	
More than 50 cases	86 (41.95)	18.44±1.94		46.41±3.64		30.66±3.74	
Unprocessed	31 (15.12)	7.32±4.88		43.94±5.84		22.35±8.20	
Are you currently participating in/have participated in research on literature, guidelines or scientific research projects related to hypotension during hemodialysis?			<0.001		0.064		<0.001
Yes	51 (24.88)	17.57±3.70		46.41±4.17		31.80±3.53	
No	154 (75.12)	14.78±5.29		45.12±4.45		27.81±5.72	

Table 2 Pearson Correlation Analysis

	Knowledge	**Attitude**	**Practice**
Knowledge	1		
Attitude	0.283 (p<0.001)	1	
Practice	0.605 (p<0.001)	0.486 (p<0.001)	1
Physician	Knowledge	Attitude	Practice
Knowledge	1		
Attitude	0.124 (P=0.367)	1	
Practice	0.540 (P<0.001)	0.480 (P<0.001)	1
Nurse	Knowledge	Attitude	Practice
Knowledge	1		
Attitude	0.287 (P<0.001)	1	
Practice	0.551 (P<0.001)	0.466 (P<0.001)	1

in hemodialysis (P1), and 3.9% rarely and 3.41% never consulted timely with other departments to develop therapeutic plans (P3) (Table S1).

Spearman Correlation Analysis

Spearman correlation analysis revealed significant positive relationships between knowledge and attitude ($r = 0.283$, $P < 0.001$), knowledge and practice ($r = 0.605$, $P < 0.001$), and attitude and practice ($r = 0.486$, $P < 0.001$). There were significant positive relationships between knowledge and practice ($r = 0.540$, $P < 0.001$), attitude and practice ($r = 0.480$, $P < 0.001$) in physician group. There were significant positive relationships between knowledge and attitude ($r = 0.287$, $P < 0.001$), knowledge and practice ($r = 0.551$, $P < 0.001$), attitude and practice ($r = 0.446$, $P < 0.001$) in nurses group (Table 2).

Univariate and Multivariate Logistic Regression Analysis

Univariate and multivariate logistic regression analysis found that knowledge (OR=1.380, 95% CI: 1.195–1.593), attitude (OR=1.198, 95% CI: 1.069–1.342), nurse (OR=0.266, 95% CI: 0.088–0.800), currently participating in/have participated in research on literature, guidelines or scientific research projects related to hypotension during hemodialysis (OR=3.541, 95% CI: 1.267–9.891) were associated with practice (Table 3).

Table 3 Logistic Regression Analysis

Practice	**Univariate logistic regression**		**Multivariate logistic regression**	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**
Knowledge	1.307 (1.202–1.423)	<0.001	1.380 (1.195–1.593)	<0.001
Attitude	1.225 (1.134–1.323)	<0.001	1.198 (1.069–1.342)	0.002
Gender				
Male	1.124 (0.545–2.316)	0.752		
Female	Ref			
Age				
Age ≤ 32	Ref		Ref	
Age > 32	2.090 (1.196–3.654)	0.010	0.665 (0.301–1.466)	0.311
Work experience				
≤5 years	Ref			
More than 5 years, less than 10 years	1.168 (0.541–2.522)	0.692		

(*Continued*)

Table 3 (Continued).

Practice	Univariate logistic regression		Multivariate logistic regression	
	OR (95% CI)	P	OR (95% CI)	P
More than 10 years, less than 15 years	1.599 (0.715–3.573)	0.253		
≥15 years	1.453 (0.676–3.125)	0.339		
Occupation				
Physician	Ref		Ref	
Nurse	0.392 (0.199–0.770)	0.007	0.266 (0.088–0.800)	0.018
Other	0.189 (0.061–0.585)	0.004	0.452 (0.051–3.987)	0.475
Professional title				
Junior	1.306 (0.396–4.306)	0.661		
Intermediate	2.400 (0.720–7.997)	0.154		
Senior or chief	3.657 (0.878–15.242)	0.075		
No professional title	Ref			
Department				
Nephrology	5.633 (2.144–14.798)	<0.001	2.094 (0.152–28.905)	0.581
Hemodialysis	3.943 (1.550–10.033)	0.004	0.891 (0.058–13.734)	0.934
Other	Ref		Ref	
Hospital type				
Tertiary Grade A	0.346 (0.035–3.394)	0.362		
Tertiary Grade B	0.511 (0.049–5.385)	0.576		
Other	Ref			
How many patients with hypotension in hemodialysis have been treated in your clinical work?				
Less than 10 cases	0.486 (0.214–1.105)	0.085	0.910 (0.245–3.380)	0.888
10–30 cases	0.312 (0.140–0.694)	0.004	0.487 (0.170–1.393)	0.179
30–50 cases	0.719 (0.251–2.058)	0.539	2.709 (0.709–10.343)	0.145
More than 50 cases	Ref		Ref	
Are you currently participating in/have participated in research on literature, guidelines or scientific research projects related to hypotension during hemodialysis?				
Yes	5.185 (2.423–11.098)	<0.001	3.541 (1.267–9.891)	0.016
No	Ref		Ref	

Path Analysis

Path analysis showed that experience of treating patients with hypotension during hemodialysis (β = 1.224, P < 0.001), numbers of patients with hypotension during hemodialysis in clinical work (β = 5.247, P < 0.001) had effects on knowledge. Knowledge had effect on attitudes (β = 0.384, P < 0.001). Knowledge (β = 0.439, P < 0.001), attitudes (β = 0.330, P < 0.001), current department (β = −0.947, P = 0.025) and experience of participating in literature related to hypotension during hemodialysis (β = 1.769, P = 0.004) had effects on practice (Table 4 and Figure 1), and demonstrated a good fit (Table S2).

Table 4 Path Analysis

Path Analysis			Estimate	S.E.	C.R.	P
Knowledge	←	Experience of treating patients with hypotension during hemodialysis	1.224	0.209	5.859	<0.001
	←	Professional title	0.112	0.275	0.407	0.684
	←	Current department	−0.473	0.380	−1.244	0.213
	←	Numbers of patients with hypotension during hemodialysis in clinical work	5.247	0.943	5.566	<0.001

(*Continued*)

Table 4 (Continued).

Path Analysis			Estimate	S.E.	C.R.	P
	←	Age	0.066	0.778	0.085	0.932
	←	Job position	−0.508	0.425	−1.195	0.232
	←	Experience of participating in literature related to hypotension during hemodialysis	1.446	0.534	2.707	0.007
	←	Work experience	0.361	0.333	1.085	0.278
Attitude	←	Knowledge	0.384	0.077	4.991	<0.001
	←	Numbers of patients with hypotension during hemodialysis in clinical work	−0.419	0.245	−1.714	0.087
Practice	←	Attitude	0.330	0.064	5.150	<0.001
	←	Knowledge	0.439	0.077	5.733	<0.001
	←	Numbers of patients with hypotension during hemodialysis in clinical work	1.509	1.029	1.467	0.142
	←	Job position	−0.625	0.482	−1.297	0.195
	←	Current department	−0.947	0.421	−2.248	0.025
	←	Experience of participating in literature related to hypotension during hemodialysis	1.769	0.620	2.853	0.004

Discussion

The study revealed that medical staff generally possess adequate knowledge, positive attitudes and practices concerning the management of hypotension in hemodialysis patients. However, these findings should be interpreted with caution due to potential biases in scoring and sampling methodologies. The scoring system, while validated for reliability, may not

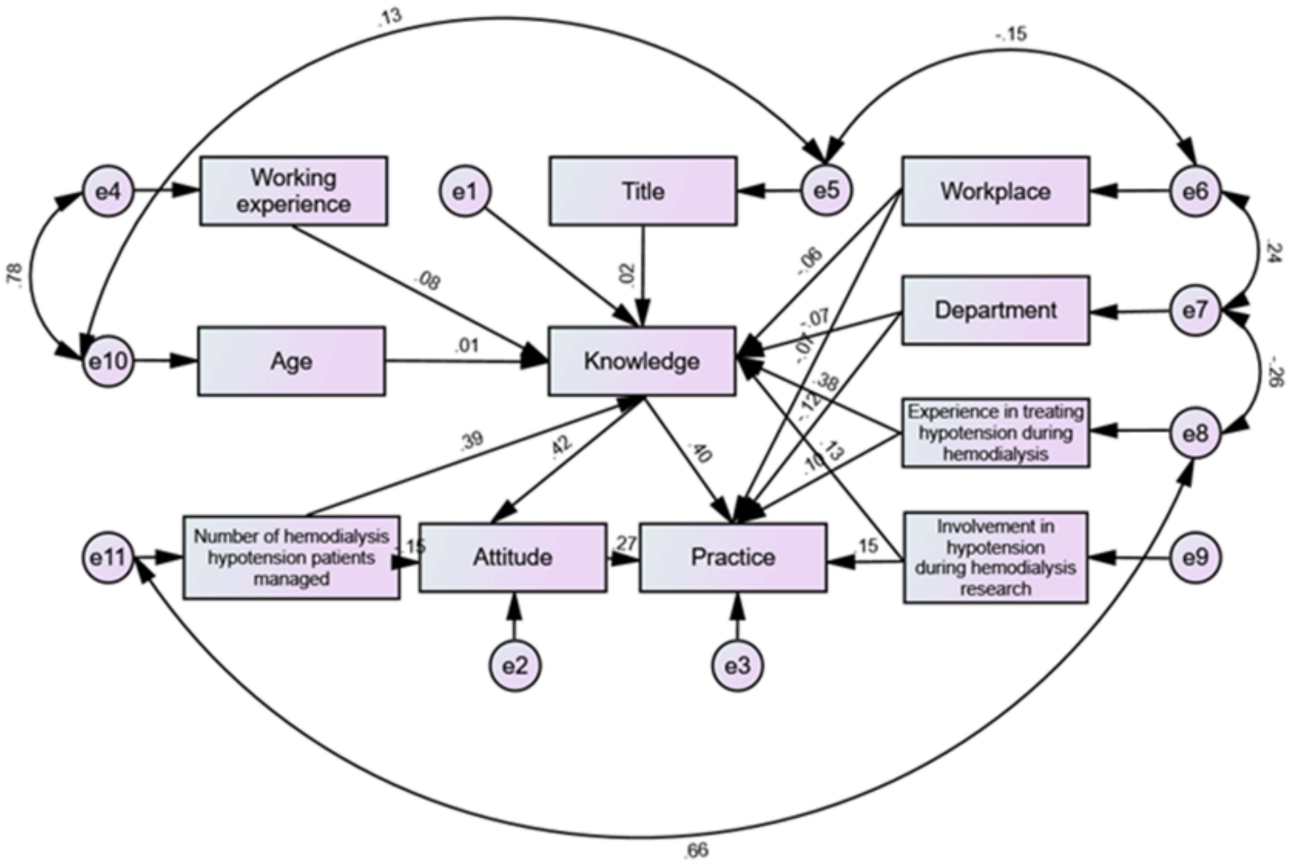

Figure 1 Path analysis. The model illustrates the direct and indirect effects of various factors on knowledge, attitudes, and practices. Key variables include age, working experience, job title, workplace, department, number of hypotension cases managed, experience treating hypotension during hemodialysis, and involvement in hypotension-related research. Knowledge positively influences attitudes and practices, with significant path coefficients indicated on the respective arrows. Residuals (e1-e11) represent unexplained variance in each variable. The thickness of the arrows corresponds to the strength of the relationships.

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fully capture real-world practices due to its reliance on self-reported data, which is prone to overestimation. Similarly, despite proportional recruitment, underrepresentation of physicians compared to nurses might have limited the generalizability of findings, particularly regarding inter-professional variations in KAP.

The findings of this study highlight the relationship between medical staff' characteristics and their KAP regarding hypotension in hemodialysis patients. Significant differences were observed based on age and work experience, where professionals older than 32 years and those with more than five years of experience demonstrated higher knowledge scores. These results suggest that increased clinical exposure and maturity could enhance understanding, a finding supported by literature that links prolonged professional engagement with improved clinical knowledge and competency.[14,15]

Profession and departmental affiliations were additional factors associated with variations in KAP scores. Physicians and staff from hemodialysis departments scored higher in knowledge and practice compared to their counterparts in other specializations. This likely reflects the frequency of encountering hypotension in clinical practice and the necessity of rapid decision-making in such settings. Interestingly, no significant difference was found in attitudes based on department, possibly indicating a uniformly high recognition across the board of the critical nature of hypotension management in hemodialysis, irrespective of departmental exposure.[16,17]

Engagement in research or related projects was another key differentiator. Professionals involved in scientific research projects related to hypotension demonstrated significantly higher knowledge and practice scores. This effect may reflect the benefits of active learning and continuous professional development on clinical practice. Although there were no significant differences based on hospital type, individuals who have treated hypotension in clinical practice scored significantly better in knowledge and practices. This observation aligns with the practical reality that hands-on experience with severe hypotensive episodes enhances clinical competence and confidence.[18,19]

Furthermore, correlation analyses and path analysis across KAP domains revealed significant positive relationships, indicating that improvements in one area might be associated with enhancements in others. For example, knowledge was found to have both direct and indirect effects on attitudes and practices, emphasizing the interconnected nature of these domains. These results are in line with previous studies which suggest that higher knowledge can lead to better attitudes and practices.[12,13]

In assessing the knowledge of medical staff about hypotension during hemodialysis, most participants were familiar with basic concepts but demonstrated knowledge gaps in certain areas. These gaps particularly in the detailed understanding of specific conditions and preventive measures. For example, fewer professionals were thoroughly familiar with the causes and more intricate preventative measures for hypotension, such as the management of medication on dialysis days or the use of specific drugs like levocarnitine and midodrine hydrochloride. To bridge these gaps, targeted educational interventions could be developed. These programs should include detailed case studies, interactive workshops focusing on the physiopathology and management of hypotension, and regular updates on the latest research and guidelines.[20,21] Additionally, incorporating simulation-based training could enhance understanding and retention of complex treatment protocols.[22–24]

The attitudes of medical staff towards managing hypotension in hemodialysis patients are generally positive, yet some concerns were noted about the uneven levels of medical management and the need for more standardized training. A significant proportion of respondents reported insufficient training and expressed the need for more comprehensive educational resources, reflecting variability in existing training standards. To address these concerns, it is advisable to implement standardized training modules across institutions, accompanied by certification processes to ensure uniformity in skills and knowledge.[25–27] Furthermore, fostering a culture of continuous professional development through regular seminars and access to online learning resources could help sustain high levels of motivation and competency.[28,29]

Regarding practices, although many professionals often engage in appropriate behaviors when managing hypotension, there is room for improvement, particularly in consistently following guidelines and consulting with peers. The limited adherence to guidelines and infrequent peer consultations suggest opportunities to enhance practical training and accessibility to updated protocols. To enhance practice behaviors, institutions should consider integrating regular peer review sessions where staff can discuss hypotension cases and management strategies, and providing quick access to guidelines and decision-support tools during dialysis sessions. Additionally, promoting interdisciplinary team meetings

could improve communication and collaborative practice, ensuring that all team members are well-prepared to manage complex cases of hypotension during hemodialysis.[30,31]

This study has several limitations that should be considered. First, the cross-sectional design limits our ability to establish causality between the variables examined. Second, the sample is drawn solely from hospitals in China, which may restrict the generalizability of the findings to other regions or healthcare settings. Third, self-reported data may introduce bias, as participants could overestimate their knowledge or practices. Finally, the frequency and severity of hypotension episodes were not systematically collected, which limits the ability to correlate findings with the actual clinical burden. Without this data, it is challenging to evaluate whether differences in practice behaviors are attributable to variations in exposure to severe cases. Future research should integrate these factors to provide a more nuanced understanding of their impact on clinical outcomes.

Conclusions

In conclusion, nephrology and hemodialysis medical staff demonstrated varying levels of knowledge, attitudes, and practices concerning the management of hypotension in hemodialysis patients. The strong positive correlations and path analysis indicate that enhanced knowledge directly contributes to favorable attitudes and practices. Specifically, knowledge was found to influence both attitudes and practices directly, with experience and departmental affiliation further modulating these relationships. It is recommended that ongoing educational and training programs be developed and implemented to sustain and enhance the knowledge base of medical staff, with a focus on addressing identified gaps in knowledge and improving guideline adherence.

Abbreviations

KAP, Knowledge, attitudes, and practices; PMP, Per million population.

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 approved by Medical Ethics Committee of Hospital of Chengdu University of Traditional Chinese Medicine (2024KL-037). Although IRB approval was obtained at the coordinating hospital, all participating hospitals belonged to the same institutional network. Informed consent was obtained when participants accessed the electronic survey link. 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.

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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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