Research article

Knowledge, attitude, and practice of healthcare providers on chronic refractory cough: A cross-sectional study

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A B S T R A C T

Objective: Previous studies from outside China showed that the knowledge, attitudes, and practice (KAP) of chronic refractory cough (CRC) was moderate among physicians. This study examined the KAP toward CRC in Chinese healthcare providers.
Methods: This single-center cross-sectional study was conducted at The Sixth Affiliated Hospital of Nantong University, Yancheng Third People's Hospital, from July 2022 to January 2023 and enrolled healthcare providers. The demographic characteristics and KAP scores were collected using a questionnaire (Cronbach's $\alpha = 0.934$) developed based on CRC guidelines.
Results: The study included 539 healthcare providers. The mean knowledge score was 8.27 ± 2.37 (maximum of 14, 59.07%), indicating poor knowledge. The highest rates of inaccuracies pertained to knowledge about the definition of chronic cough, empirical treatment methods, and potential risks of different treatments, suggesting a need for unified training in all aspects of CRC for medical staff. The mean attitude score was 49.74 ± 63.63 (maximum of 60, 82.90%), indicating favorable attitudes. Most healthcare providers believed that CRC affects normal work and life and that it would be necessary to provide more help to patients from the perspectives of drug treatment and psychological counseling. The mean practice score was 23.20 ± 6.28 (maximum of 35, 66.29%), indicating poor practice.
Conclusion: This study suggests that healthcare providers in Yancheng have poor knowledge, favorable attitudes, and poor practice of CRC. This study provides points that should be targeted in future training and continuing education activities.

1. Introduction

Chronic cough is arbitrarily defined as cough lasting for >8 weeks [1–3], while chronic refractory cough (CRC) is a chronic cough that persists despite treatments [1–3]. The estimated worldwide prevalence of chronic cough is 2%–18% [4]. The most common causes

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of chronic cough in adults include upper airway cough syndrome (previously called postnasal drip syndrome), asthma (including cough-variant asthma), gastroesophageal reflux disorder (GERD), smoking, and angiotensin-converting enzyme (ACE) inhibitors [3, 5–7]. Postinfectious cough can be due to an upper respiratory infection (URI) or bronchitis but often resolves within 8 weeks [8]. Other conditions to consider include bronchiectasis, lung cancer, and eosinophilic bronchitis [3,7]. The management of CRC involves the treatment of the primary cause, e.g., smoking cessation, proton pump inhibitor for GERD, asthma therapy, etc. [8–12]. The complications of chronic cough include syncope, urinary incontinence, rib fracture, pneumothorax, lung herniation, anxiety, depression, fatigue, and somatic and physical symptoms [7,13]. Chronic cough can be long-lasting in several patients [14]. Because of the variety of conditions that can cause chronic cough and the different definitions, the exact misdiagnosis rate is unknown, but the misdiagnosis of chronic cough can increase the patient burden since they can be exposed to ineffective treatments or undergo inappropriate investigations; indeed, a study in the United Kingdom showed that 43% of patients with probable chronic cough and 55% of those with chronic cough were prescribed empirical antibiotics that would be ineffective [15].

Appropriate knowledge, attitudes, and practices (KAP) of patients with CRC should help them identify their causes of CRC and adopt proper habits to prevent and manage CRC. A KAP survey provides quantitative and qualitative data about a specific subject in a specific population [16,17]. KAP surveys can help identify gaps and obstacles that can be addressed by teaching, training, and continuing education activities [16,17]. Previous studies examined the KAP of physicians toward chronic cough and generally showed moderate KAP regarding the diagnosis and management of chronic cough [18,19]. A patient-perspective study showed that only 30% of the patients thought their physician had managed their cough adequately [20]. A study in China revealed that the KAP of parents of children with asthma was poor [21]. Still, data about the KAP toward CRC among Chinese healthcare providers are lacking.

Therefore, this study examined the KAP toward CRC in Chinese healthcare providers. This study could help identify areas requiring refinements in the training of healthcare providers.

2. Methods

2.1. Study design and participants

This single-center cross-sectional study was conducted at The Sixth Affiliated Hospital of Nantong University, Yancheng Third People's Hospital, from July 2022 to January 2023. The participants were healthcare providers (including nurses and physicians).

The inclusion criteria were 1) healthcare providers working in Yancheng Third People's Hospital and 2) voluntary participation in this study. Trainees were excluded. The study was approved by the Medical Ethics Committee of The Sixth Affiliated Hospital of Nantong University, Yancheng Third People's Hospital (approval #2022-92). All participants signed the informed consent form before completing the survey.

2.2. Basic information about the questionnaire

The questionnaire was designed based on the Chinese national guidelines on the diagnosis and management of cough (2021) [22] and on international guidelines [1,5,9]. The questionnaire was modified according to the comments from three senior experts. A pilot study was performed using 40 questionnaires and revealed a Cronbach's α of 0.934, indicating that the questionnaire had a high internal consistency.

The final questionnaire was in Chinese and included four dimensions: demographic data (gender, age, marital status, highest education, department, years of working, professional title, job satisfaction, and type of employment), knowledge dimension, attitude dimension, and practice dimension. There were 14 items in the knowledge dimension. One point was awarded for correct answers and 0 for incorrect or unclear answers. The total score ranged from 0 to 14 points. The attitude dimension contained 13 items scored using a Likert five-point scale from strongly positive (5 points) to strongly negative (1 point). The total score ranged from 13 to 65 points. The practice dimension contained nine items, of which seven were scored on a Likert five-point scale. The score was from always (5 points) to never (1 point), and the total score ranged from 7 to 35 points. The remaining two practice items were open-ended, without scores, and collected data about the means to understanding and learning about CRC and the key methods that were subjectively believed to improve the treatment effect and patient's quality of life.

The questionnaire was designed and created using the professional online platform "Questionnaire Star" (Changsha Ranxing Information Technology Co., Ltd.). The online electronic version of the questionnaire was published using "Questionnaire Star" and distributed to the participants through the hospital's WeChat group under a QR code. The questionnaire results were summarized in an Excel spreadsheet. The completeness, consistency, and validity of all questionnaires were checked by the investigators.

2.3. Statistical analysis

The minimal sample size was based on 5–20 times the number of KAP items in the questionnaire (36 items × 5 to 20 = 180 to 720) [23]. The aim was to collect at least 480 questionnaires based on an 80% effective response rate.

Descriptive analyses were performed for the demographic data and KAP scores. A modified Bloom cutoff was used to define good knowledge, favorable attitude, and proactive practice as ≥70% of the maximum score for each dimension [24,25]. The continuous data were expressed as means ± standard deviations. The continuous variables were tested for normality using the Kolmogorov-Smirnov test. If the data conformed to the normal distribution, the t-test was used to compare two groups. If the data did not conform to the normal distribution, the Wilcoxon-Mann-Whitney test was used to compare two groups. ANOVA was used to

compare three or more groups of continuous variables that conformed to the normal distribution and had homogeneous variance. The Kruskal-Wallis analysis of variance was used for the comparison among three or more groups of continuous variables not meeting the normal distribution or with non-homogeneous variance. The categorical data were expressed as n (%) and analyzed using the chi-squared test. This study also explored the correlation among KAP scores. Univariable and multivariable logistic regression analyses were performed to examine the factors independently associated with the KAP scores. Variables with P < 0.05 in the univariable analyses were included in the multivariable analyses. Statistical analysis was performed using Stata 17.0 (Stata Corporation, College Station, TX, USA). Two-sided P-values <0.05 were considered statistically significant.

3. Results

3.1. Characteristics of the participants

The study included 539 healthcare providers. The greatest proportions were female (62.52%), 31–40 years of age (50.28%), married (84.42%), with a bachelor's degree (63.64%), from non-respiratory and non-thoracic surgery departments (77.35%), with ≥10 years of experience (56.77%), with intermediate job titles (39.29%), with a relative satisfaction with their job (41.93%), and with formal employment (60.30%) (Table 1).

Table 1
Comparison of KAP scores of participants with different characteristics.

Variables	n (%)	Knowledge scores		Attitude scores		Practice scores	
		Mean ± SD	P	Mean ± SD	P	Mean ± SD	P
Total scores	539 (100)	8.27 ± 2.37		49.74 ± 6.63		23.20 ± 6.28	
Gender			0.017		0.252		0.928
Male	202 (37.48)	8.63 ± 2.34		49.32 ± 6.46		23.31 ± 6.51	
Female	337 (62.52)	8.07 ± 2.37		49.99 ± 6.72		23.13 ± 6.14	
Age			0.005		0.104		0.777
21-30	128 (23.75)	8.05 ± 2.41		50.10 ± 6.49		23.45 ± 6.34	
31-40	271 (50.28)	8.11 ± 2.40		50.17 ± 6.81		23.04 ± 6.58	
41-50	89 (16.51)	9.02 ± 2.02		48.61 ± 6.48		23.04 ± 5.85	
>50	51 (9.46)	8.47 ± 2.52		48.53 ± 5.96		23.67 ± 5.24	
Marital status			0.303		0.071		0.073
Unmarried	81 (15.03)	8.26 ± 2.25		51.23 ± 5.93		24.46 ± 6.18	
Married	455 (84.42)	8.30 ± 2.39		49.51 ± 6.69		23.02 ± 6.25	
Divorced	2 (0.37)	5.00 ± 2.83		44.00 ± 11.31		21.00 ± 2.83	
Widowed	1 (0.39)	8.00		42.00		7.00	
Highest education			<0.001		0.003		0.005
Junior college and below	15 (2.78)	7.07 ± 2.69		49.87 ± 8.68		26.13 ± 6.53	
Bachelor's	343 (63.64)	8.04 ± 2.33		50.58 ± 6.46		23.65 ± 6.11	
Master's	161 (29.87)	8.80 ± 2.31		47.98 ± 6.57		21.99 ± 6.27	
Doctor	20 (3.71)	9.10 ± 2.53		49.35 ± 5.79		22.95 ± 7.71	
Department			<0.001		0.169		0.001
Respiratory department	78 (20.91)	10.31 ± 2.05		50.67 ± 5.76		25.18 ± 4.23	
Thoracic surgery department	32 (1.74)	7.91 ± 2.45		48.44 ± 4.34		24.38 ± 6.39	
Others	424 (77.35)	7.98 ± 2.22		49.67 ± 6.92		22.75 ± 6.52	
Years of working			<0.001		0.744		0.300
≤1 year	53 (9.83)	7.45 ± 2.95		49.79 ± 6.58		24.64 ± 6.93	
1–3 years	45 (8.35)	8.38 ± 2.37		50.80 ± 6.31		23.11 ± 6.62	
3–5 years	54 (10.02)	7.63 ± 2.19		50.37 ± 5.26		23.52 ± 6.06	
5–10 years	81 (15.03)	7.91 ± 2.44		49.57 ± 7.84		22.27 ± 6.69	
≥10 years	306 (56.77)	8.62 ± 2.22		49.51 ± 6.56		23.15 ± 6.02	
Professional title			<0.001		0.001		0.192
Junior	163 (30.35)	7.87 ± 2.54		50.96 ± 6.49		23.89 ± 6.48	
Intermediate	211 (39.29)	8.03 ± 2.38		50.00 ± 6.96		22.85 ± 6.35	
Sub-senior	109 (20.30)	8.98 ± 2.03		48.19 ± 6.00		22.45 ± 5.94	
Senior	54 (10.06)	9.11 ± 2.03		48.06 ± 6.21		23.69 ± 5.84	
Job satisfaction			0.215		<0.001		<0.001
Very satisfied	187 (34.69)	8.06 ± 2.41		52.69 ± 6.21		25.04 ± 6.72	
Relatively satisfied	226 (41.93)	8.55 ± 2.15		48.95 ± 6.10		22.83 ± 5.57	
Generally satisfied	119 (22.08)	8.09 ± 2.63		47.10 ± 6.42		21.33 ± 6.08	
Not very satisfied	5 (0.93)	8.80 ± 3.96		39.60 ± 3.29		19.00 ± 6.12	
Very dissatisfied	2 (0.37)	7.50 ± 0.71		45.00 ± 1.41		14.50 ± 2.12	
Type of employment			<0.001		<0.001		0.001
Formal	325 (60.30)	8.82 ± 2.27		48.82 ± 6.35		22.50 ± 6.20	
Contract	195 (36.18)	7.66 ± 2.06		51.45 ± 6.57		24.41 ± 6.07	
Personnel agency	19 (3.53)	5.42 ± 3.53		48.00 ± 8.36		22.58 ± 8.02	

3.2. Knowledge dimension

The mean knowledge score was 8.27 ± 2.37 (maximum of 14, 59.07%), indicating poor knowledge. Higher scores were observed in males (P = 0.017), older age (P = 0.005), those with higher education (P < 0.001), working in the respiratory department (P < 0.001), longer work experience (P < 0.001), higher professional title (P < 0.001), and formal employment (P < 0.001) (Table 1).

Table 2 shows the knowledge scores of the healthcare providers who participated in the study. The items with low scores that need to be paid attention to included K1 ("Clinically, chronic cough is defined as a cough lasting more than 6 weeks."), K6 ("The duration of empirical treatment for chronic cough is 1–2 weeks."), K7 ("Proton pump inhibitors (PPIs) can be used to treat chronic refractory cough caused by chronic throat diseases."), K10 ("Muscle relaxants (such as baclofen) combined with PPI have better effects on the treatment of chronic refractory cough caused by chronic asthma"), and K11 ("Lidocaine has the effect of temporarily relieving chronic refractory cough after atomization, but, like morphine, it needs to pay attention to addiction.").

3.3. Attitude dimension

The mean attitude score was 49.74 ± 63.63 (maximum of 60, 82.90%), indicating favorable attitudes. Higher attitude scores were observed in participants with a bachelor's degree (P = 0.003), junior or intermediate job titles (P = 0.001), high job satisfaction (P < 0.001), and participants with contract employment (P < 0.001) (Table 1).

Table 3 shows the attitude scores of the participants. Most healthcare providers had a positive attitude. Nevertheless, it should be noted that more than 90% of the participants had a negative attitude toward A6 ("You believe that patients generally feel that chronic refractory cough affects normal work life").

3.4. Practice dimension

The mean practice score was 23.20 ± 6.28 (maximum of 35, 66.29%), indicating poor practice. Higher practice scores were observed in participants with a junior college or below education (P = 0.005), working in the respiratory department (P = 0.001), with high job satisfaction (P < 0.001), and with contract employment (P = 0.001) (Table 1).

Table 4 shows that the practice of most healthcare providers was at a moderate level. Items P8 showed that the most common learning methods about CRC were textbooks (71.19%), research articles, guidelines, and consensuses (69.57%), network media (59.18%), lectures (55.66%), and academic conferences (57.70%). The key methods to improve the management of CRC and the

Table 2
Knowledge dimension of medical staff on chronic refractory cough.

Knowledge	N (%)		Mean
	True	False	Mean scores
1. Clinically, chronic cough is defined as a cough lasting more than 6 weeks.	119 (22.08)	420 (77.92)	0.22
2. Clinically, a chronic cough that cannot be relieved by symptomatic treatment is defined as a refractory cough.	466 (86.46)	73 (13.54)	0.86
3. Unexplained chronic cough is also a chronic refractory cough, often accompanied by cough hypersensitivity syndrome.	479 (88.87)	60 (11.13)	0.89
4. No population is prone to chronic refractory cough.	316 (58.63)	223 (41.37)	0.59
5. Diagnosing chronic refractory cough requires systematically investigating the underlying cause, combined with the medical history, laboratory tests, empirical treatment results, and living environment.	490 (90.91)	49 (9.09)	0.91
6. The duration of empirical treatment for chronic cough is 1–2 weeks.	120 (22.26)	419 (77.74)	0.22
7. Proton pump inhibitors (PPIs) can be used to treat chronic refractory cough caused by chronic throat diseases.	111 (20.59)	428 (79.41)	0.21
8. The use of proton pump inhibitors (PPIs), especially in older patients with underlying chronic disease, requires consideration of benefits and risks of adverse effects.	447 (82.93)	92 (17.07)	0.83
9. Calcium channel modulators (such as gabapentin, etc.) can improve the sleep quality of patients in addition to analgesic and antitussive effects.	401 (74.40)	138 (25.60)	0.74
10. Muscle relaxants (such as baclofen) combined with PPI better treat chronic refractory cough caused by chronic asthma.	60 (11.13)	479 (88.87)	0.11
11. Lidocaine has the effect of temporarily relieving chronic refractory cough after atomization, but, like morphine, it needs to pay attention to addiction.	120 (22.26)	419 (77.74)	0.22
12. The freshness and circulation of the patient's bedroom air were maintained to ensure appropriate temperature and humidity, which can inhibit partly chronic cough induced by air stimulation.	492 (91.28)	47 (8.72)	0.91
13. Patients with chronic refractory cough have no special attention in the diet.	354 (65.68)	185 (34.32)	0.66
14. Emotional irritability and nervousness may induce chronic cough, and doing a good job in psychological nursing and counseling patients is necessary.	487 (90.52)	51 (9.48)	0.91

Note: Qualified (≥60% total score): 277 cases, accounting for 51.39%. Per capita K score: 8.28 scores, accounting for 59.13% of the total score.

Table 3
Attitude dimension of medical staff on chronic refractory cough.

	Strongly agree	Agree	Neutrality	Disagree	Strongly disagree
1. You are interested in research progress and new treatments for chronic refractory cough.	236 (43.78)	193 (35.81)	102 (18.92)	6 (1.11)	2 (0.37)
2. You are willing to take the initiative to learn about a chronic refractory cough.	258 (47.96)	202 (37.55)	72 (13.38)	5 (0.93)	1 (0.19)
3. You are willing to be trained on a chronic refractory cough.	257 (47.68)	208 (38.59)	66 (12.24)	7 (1.30)	1 (0.19)
4. You think doctors/nurses should have the knowledge and routine care related to chronic refractory cough.	301 (55.84)	191 (35.44)	44 (8.16)	2 (0.37)	1 (0.19)
5. You believe patients generally attach great importance to the dangers of chronic refractory cough.	221 (41.00)	175 (32.47)	106 (19.67)	34 (6.31)	3 (0.56)
6. You believe patients generally feel chronic refractory cough affects normal work life.	246 (45.64)	252 (46.75)	38 (7.05)	3 (0.56)	0
7. You believe that current therapy for chronic refractory cough is effective.	155 (28.76)	222 (41.19)	144 (26.72)	18 (3.34)	0
8. You think patients with chronic refractory cough can follow the doctor's instructions well to implement the therapy.	157 (29.13)	192 (35.62)	156 (28.94)	32 (5.94)	2 (0.37)
9. You think LABA/ICS inhalation preparations (such as Symbicort, Seretide, etc.) can treat patients with chronic refractory cough.	110 (20.41)	157 (29.13)	113 (20.96)	138 (25.60)	21 (3.90)
10. You think that current respiratory doctors and nurses have the qualified knowledge of chronic refractory cough.	136 (25.23)	238 (44.16)	132 (24.49)	32 (5.94)	1 (0.19)
11. You believe that therapies proposed by current respiratory doctors are effective for chronic refractory cough.	140 (25.97)	251 (46.57)	134 (24.86)	13 (2.41)	1 (0.19)
12. During treatment for chronic refractory cough, you often encounter cases in which the treatment plan has been adjusted multiple times.	170 (31.54)	284 (52.69)	75 (13.91)	10 (1.86)	0
13. You think you have given sufficient feasible suggestions for patients regarding personal environment improvement, diet, exercise, adjustment plan, etc.	197 (36.55)	248 (46.01)	84 (15.58)	10 (1.86)	0

Note: Qualified ($\geq$60% total score): 17 cases, accounting for 3.15%. Per capita A score: 49.74 scores, accounting for 76.52% of the total score.

patient quality of life were "Detailed education on disease knowledge, status, and hazards at the time of presentation" (89.59%), "Detailed treatment information" (82.34%), "Good compliance and personal care habits" (79.78%), and "Development and application of emerging medical technologies" (77.37%).

3.5. Correlation analysis

The knowledge scores were not correlated to the attitude and practice scores (both $P > 0.05$), but the attitude scores were correlated to the practice scores ($r = 0.180$, $P < 0.05$) (Table 5).

3.6. Multivariable analyses

Working in the thoracic surgery (OR = 0.13, 95%CI: 0.04–0.36, $P < 0.001$) or other (OR = 0.10, 95%CI: 0.05–0.19, $P < 0.001$) department (compared with working in the respiratory department) and with contract (OR = 0.31, 95%CI: 0.18–0.56, $P < 0.001$) or personnel agency (OR = 0.08, 95%CI: 0.01–0.71, $P = 0.023$) employment (compared with formal employment) were independently negatively associated with the knowledge scores, while having $\geq$10 years of experience (OR = 4.08, 95%CI: 1.08–15.40, $P = 0.038$; compared with $\leq$1 year of experience) and being generally satisfied with the job (OR = 2.01, 95%CI: 1.10–3.68, $P = 0.022$, compared with very satisfied) were independently positively associated with the knowledge scores (Table 6).

Being relatively satisfied (OR = 0.41, 95%CI: 0.23–0.71, $P = 0.002$) or generally satisfied (OR = 0.17, 95%CI: 0.09–0.33, $P < 0.001$) with the job (compared with being very satisfied) was independently negatively associated with the attitude scores (Table 7).

Having 1–3 years (OR = 0.38, 95%CI: 0.14–0.98, $P = 0.047$), 5–10 years (OR = 0.20, 95%CI: 0.07–0.59, $P = 0.004$), or $\geq$10 years (OR = 0.17, 95%CI: 0.05–0.51, $P = 0.002$) of experience (compared with $\leq$1 year of experience) was independently negatively associated with the practice scores, while the attitude scores (OR = 1.17, 95%CI: 1.13–1.22, $P < 0.001$) and having sub-senior (OR = 3.25, 95%CI: 1.27–8.26, $P = 0.013$) or senior (OR = 5.53, 95%CI: 1.87–16.30, $P = 0.002$) professional title (compared with junior title) were independently positively associated with the practice scores (Table 8).

3.7. Subgroup analysis

Supplementary Table S1 presents the characteristics of the respiratory and non-respiratory healthcare providers. Compared with the non-respiratory group, the respiratory group had more males ($P = 0.010$), were older ($P < 0.001$), had higher professional titles ($P = 0.010$), and had more formal employees ($P = 0.002$). Supplementary Tables S2–S4 show the differences in KAP items between the two groups. Significant differences were observed for K1, K7, K8, K10, K11, K13, A1, A2, A3, A9, A10, A11, P1, P2, P3, P4, P5, and P6.

Table 4
Practice dimension of medical staff on chronic refractory cough.

	Frequency *				
	Always	Usually	Sometimes	Occasionally	Never
1. How often do you actively learn about the research progress and new treatment of chronic refractory cough?	96 (17.81)	132 (24.49)	161 (29.87)	119 (22.08)	31 (5.75)
2. How often do you have training on disease research advances and new treatments for chronic refractory cough?	80 (14.84)	116 (21.52)	168 (31.17)	130 (24.12)	45 (8.35)
3. How often do you encounter cases of chronic refractory cough per month?	59 (10.95)	129 (23.93)	150 (27.83)	158 (29.31)	43 (7.98)
4. For the treatment of patients with chronic refractory cough, how often do you change the drug on average?	60 (11.13)	130 (24.12)	213 (39.52)	99 (18.37)	37 (6.86)
5. How often do you actively encourage patients to participate in the knowledge of chronic refractory cough and personal care methods?	94 (17.47)	170 (31.60)	175 (32.53)	77 (14.31)	22 (4.09)
6. During the diagnosis and treatment of chronic refractory cough, how often do you actively ask about the patient's feelings?	137 (25.42)	229 (42.49)	121 (22.45)	33 (6.12)	19 (3.53)
7. How often do you actively give feedback to the department to seek expert consultation for difficult cases with refractory cough?	103 (19.18)	169 (31.47)	163 (30.35)	74 (13.78)	28 (5.21)
8. What are your previous approaches to understanding and learning about the diagnosis and treatment of chronic refractory cough (Multiple choices)	Textbook	Research articles, guides, consensus	Network media	Lectures on special topics	Academic conference	Other
	383 (71.19)	375 (69.57)	319 (59.18)	300 (55.66)	311 (57.70)	67 (12.43)
9. Which method do you think is the key to improving the treatment effect of chronic refractory cough and improving the quality of life of patients (Multiple choices)	Detailed education on disease knowledge, status, and hazards at the time of presentation	Detailed treatment information	Development and application of emerging medical technologies	Good compliance and personal care habits	Other
	482 (89.59)	443 (82.34)	417 (77.37)	430 (79.78)	138 (25.60)

Note: Qualified (≥60% total score): 227 cases, accounting for 42.12%. Per capita P score: 23.20 scores, accounting for 66.28% of the total score

Always: practice frequency in the past 2 months is >9 times; Usually: practice frequency in the past 2 months is 7-9 times; Sometimes: practice frequency in the past 2 months is 4-6 times; Occasionally: practice frequency in the past 2 months is 1-3 times; Never: practice frequency in the past 2 months is 0 times.

Table 5
Correlation analysis of knowledge, attitude, and practice of healthcare providers on chronic refractory cough.

	Knowledge	Attitude	Practice
Knowledge	1		
Attitude	0.047	1	
Practice	0.041	0.480 (P < 0.05)	1

Table 6
Univariable and multivariable analyses of the knowledge scores (based on 70% of the total score).

Knowledge	Univariable		Multivariable	
	OR (95%CI)	P	OR (95%CI)	P
Gender				
Male	Ref.			
Female	0.72 (0.49,1.05)	0.096		
Age				
21-30	Ref.		Ref.	
31-40	1.32 (0.80,2.19)	0.27	1.13 (0.46,2.77)	0.783
41-50	2.42 (1.32,4.42)	0.004	0.84 (0.27,2.60)	0.773
>50	2.04 (0.99,4.16)	0.05	0.83 (0.21,3.21)	0.798
Marital status				
Unmarried	Ref.			
Married	1.44 (0.82,2.53)	0.198		
Divorced	–	–		
Widowed	–	–		
Highest education				
Junior college and below	Ref.			
Bachelor's	2.10 (0.46,9.53)	0.333		
Master's	3.66 (0.79,16.7)	0.095		
Doctor	3.5 (0.60,20.1)	0.16		
Department				
Respiratory department	Ref.		Ref.	
Thoracic surgery department	0.16 (0.06,0.42)	**<0.001**	0.13 (0.04,0.36)	**<0.001**
Others	0.13 (0.08,0.23)	**<0.001**	0.10 (0.05,0.19)	**<0.001**
Years of working				
≤1 year	Ref.		Ref.	
1–3 years	1.74 (0.68,4.48)	0.246	2.63 (0.89,7.74)	0.078
3–5 years	0.64 (0.22,1.83)	0.406	0.65 (0.18,2.29)	0.506
5–10 years	1.40 (0.60,3.31)	0.43	2.25 (0.67,7.58)	0.188
≥10 years	2.11 (1.02,4.38)	**0.043**	4.08 (1.08,15.4)	**0.038**
Professional title				
Junior	Ref.		Ref.	
Intermediate	1.12 (0.69,1.82)	0.636	0.52 (0.21,1.29)	0.161
Sub-senior	2.21 (1.29,3.77)	**0.004**	0.60 (0.20,1.76)	0.358
Senior	2.42 (1.25,4.67)	**0.008**	0.47 (0.12,1.87)	0.29
Job satisfaction				
Very satisfied	Ref.		Ref.	
Relatively satisfied	1.58 (1.01,2.46)	**0.043**	1.35 (0.81,2.25)	0.245
Generally satisfied	1.49 (0.88,2.52)	0.128	2.01 (1.10,3.68)	0.022
Not very satisfied	2.30 (0.37,14.2)	0.37	1.91 (0.20,17.6)	0.566
Very dissatisfied	–	–	–	–
Type of employment				
Formal	Ref.		Ref.	
Contract	0.32 (0.20,0.51)	**<0.001**	0.31 (0.18,0.56)	**<0.001**
Personnel agency	0.09 (0.01,0.72)	**0.024**	0.08 (0.01,0.71)	**0.023**

Among respiratory healthcare providers, contract employment (OR = 0.04, 95%CI: 0.00–0.28, P = 0.001; compared with formal employment) was independently negatively associated with the knowledge scores, while having 5–10 years (OR = 31.70, 95%CI: 3.13–438.00, P = 0.004) or ≥10 years (OR = 75.70, 95%CI: 2.98–1918.00, P = 0.009) of experience (compared with ≤1 year) was independently positively associated with the knowledge scores (Supplementary Table S5). No factors were independently associated with the attitude scores (Supplementary Table S6). Having 1–3 years (OR = 0.02, 95%CI: 0.00–0.47, P = 0.015), 3–5 years (OR = 0.09, 95%CI: 0.01–0.84, P = 0.034), 5–10 years (OR = 0.02, 95%CI: 0.00–0.27, P = 0.003), or ≥10 years (OR = 0.01, 95%CI: 0.00–0.16, P = 0.001) of experience (compared with ≤1 year) was independently negatively associated with the practice scores, while the attitude scores (OR = 1.20, 95%CI: 1.07–1.34, P = 0.001) and holding a sub-senior (OR = 9.26, 95%CI: 1.41–60.6, P = 0.020) or senior (OR = 23.80, 95%CI: 2.95–193.00, P = 0.003) title (compared with a junior title) were independently positively associated with the practice scores (Supplementary Table S7).

Table 7
Univariable and multivariable analyses of the attitude scores (based on 70% of the total score).

Attitude	Univariable		Multivariable	
	OR (95%CI)	P	OR (95%CI)	P
Knowledge	0.99 (0.91,1.07)	0.836		
Gender				
Male	Ref.			
Female	1.20 (0.80,1.79)	0.374		
Age				
21-30	Ref.			
31-40	1.00 (0.60,1.67)	0.981		
41-50	0.67 (0.36,1.26)	0.22		
>50	0.56 (0.27,1.14)	0.113		
Marital status				
Unmarried	Ref.		Ref.	
Married	0.40 (0.20,0.80)	**0.01**	0.47 (0.20,1.06)	0.07
Divorced	0.14 (0.00,2.43)	0.178		
Widowed	–	–	–	–
Highest education	–	–	–	–
Junior college and below	Ref.			
Bachelor's	1.32 (0.40,4.27)	0.641		
Master's	0.83 (0.25,2.73)	0.761		
Doctor	2.06 (0.38,11.0)	0.398		
Department				
Respiratory department	Ref.			
Thoracic surgery department	0.65 (0.24,1.76)	0.403		
Others	0.64 (0.34,1.18)	0.157		
Years of working				
≤1 year	Ref.			
1–3 years	1.26 (0.43,3.64)	0.666		
3–5 years	1.02 (0.38,2.70)	0.963		
5–10 years	0.58 (0.25,1.35)	0.213		
≥10 years	0.65 (0.31,1.36)	0.262		
Professional title				
Junior	Ref.		Ref.	
Intermediate	0.91 (0.54,1.53)	0.743	1.45 (0.77,2.71)	0.241
Sub-senior	0.47 (0.27,0.83)	**0.009**	0.72 (0.36,1.45)	0.364
Senior	0.39 (0.20,0.78)	**0.008**	0.50 (0.22,1.14)	0.101
Job satisfaction				
Very satisfied	Ref.		Ref.	
Relatively satisfied	0.43 (0.25,0.74)	**0.002**	0.41 (0.23,0.71)	**0.002**
Generally satisfied	0.22 (0.12,0.39)	**<0.001**	0.17 (0.09,0.33)	**<0.001**
Not very satisfied	–	–	–	–
Very dissatisfied	0.14 (0.00,2.32)	0.17	0.12 (0.00,2.21)	0.158
Type of employment				
Formal	Ref.		Ref.	
Contract	2.08 (1.32,3.28)	**0.001**	1.55 (0.90,2.65)	0.107
Personnel agency	0.67 (0.25,1.77)	0.427	0.62 (0.20,1.93)	0.419

Among non-respiratory healthcare providers, contract employment (OR = 0.45, 95%CI: 0.25–0.80, P = 0.007; compared with formal employment) was independently negatively associated with the knowledge scores, while being generally satisfied (OR = 2.21, 95%CI: 1.14–4.27, P = 0.018) (compared with very satisfied) was independently positively associated with the knowledge scores (Supplementary Table S8). Having a senior title (OR = 0.22, 95%CI: 0.05–0.92, P = 0.038; compared with a junior title), being relatively satisfied (OR = 0.29, 95%CI: 0.15–0.56, P < 0.001) or generally satisfied (OR = 0.16, 95%CI: 0.07–0.32, P < 0.001) (compared with very satisfied), and personnel agency (OR = 0.21, 95%CI: 0.06–0.75, P = 0.016) were independently negatively associated with the attitude scores (Supplementary Table S9). The attitude scores (OR = 1.20, 95%CI: 1.07–1.34, P = 0.001) were independently positively associated with the practice scores (Supplementary Table S10).

4. Discussion

Previous studies from outside China showed that the KAP of CRC was moderate among physicians. This study examined the KAP toward CRC of Chinese healthcare providers. The results suggest that healthcare providers in Yancheng had poor knowledge, favorable attitudes, and poor practice of CRC. This study provides points that should be targeted in future training and continuing education activities.

Previous studies reported relatively moderate KAP toward chronic cough among physicians. Indeed, Leuppi et al. [18] (from Switzerland) reported that 39% of general practitioners and 73% of pneumologists could adequately define chronic cough, and most physicians (72%) reported gaps in treatment patterns. Shields et al. [19] (from the United States of America) reported that only 50% of

Table 8

Univariable and multivariable analyses of the practice scores (based on 70% of the total score).

Practice	Univariable		Multivariable	
	OR (95%CI)	P	OR (95%CI)	P
Knowledge	0.99 (0.92,1.07)	0.975		
Attitude	1.16 (1.12,1.19)	**<0.001**	1.17 (1.13,1.22)	**<0.001**
Gender				
Male	Ref.			
Female	0.89 (0.62,1.26)	0.52		
Age				
21-30	Ref.	Ref.		
31-40	0.71 (0.46,1.09)	0.124		
41-50	0.73 (0.42,1.27)	0.271		
>50	0.73 (0.37,1.41)	0.353		
Marital status				
Unmarried	Ref.		Ref.	
Married	0.53 (0.32,0.85)	**0.009**	0.95 (0.47,1.92)	0.907
Divorced	–	–	–	–
Widowed	–	–	–	–
Highest education				
Junior college and below	Ref.		Ref.	
Bachelor's	0.37 (0.12,1.13)	0.083	0.43 (0.10,1.79)	0.251
Master's	0.24 (0.07,0.75)	**0.014**	0.41 (0.09,1.76)	0.234
Doctor	0.40 (0.10,1.64)	0.207	0.68 (0.11,3.88)	0.666
Department				
Respiratory department	Ref.			
Thoracic surgery department	0.97 (0.42,2.22)	0.957		
Others	0.70 (0.43,1.14)	0.16		
Years of working				
≤1 year	Ref.		Ref.	
1–3 years	0.51 (0.23,1.16)	0.11	0.38 (0.14,0.98)	0.047
3–5 years	0.82 (0.38,1.76)	0.618	0.60 (0.23,1.61)	0.318
5–10 years	0.35 (0.17,0.72)	**0.005**	0.20 (0.07,0.59)	0.004
≥10 years	0.42 (0.23,0.76)	**0.004**	0.17 (0.05,0.51)	0.002
Professional title				
Junior	Ref.		Ref.	
Intermediate	0.59 (0.39,0.90)	**0.016**	1.52 (0.74,3.10)	0.247
Sub-senior	0.61 (0.37,1.01)	0.056	3.25 (1.27,8.26)	0.013
Senior	0.78 (0.42,1.46)	0.454	5.53 (1.87,16.3)	0.002
Job satisfaction				
Very satisfied	Ref.		Ref.	
Relatively satisfied	0.51 (0.34,0.76)	**0.001**	0.97 (0.61,1.55)	0.911
Generally satisfied	0.40 (0.24,0.65)	**<0.001**	0.97 (0.54,1.75)	0.927
Not very satisfied	0.22 (0.02,2.02)	0.182	4.43 (0.40,48.3)	0.222
Very dissatisfied	–	–	–	–
Type of employment				
Formal	Ref.		Ref.	
Contract	1.66 (1.16,2.38)	**0.005**	1.66 (0.97,2.86)	0.064
Personnel agency	1.02 (0.39,2.67)	0.962	0.89 (0.21,3.67)	0.873

the physicians could describe chronic cough according to the guidelines, and most participants declared trying to find the cause of chronic cough before referring. Similar results were observed in Spain [26], India [27], and Italy [28]. The variable and unclear terminology used for chronic cough and related conditions can contribute to the confusion [29,30]. There are also differences among countries regarding how chronic cough is managed [31,32]. In addition, a study showed that the symptoms of chronic cough are more often treated than the underlying condition [4]. It is probably why a study reported that only 30% of patients thought that their physician managed their chronic cough adequately [20]. A study also suggested that managing patients with chronic cough is unduly time-consuming and expensive [33], suggesting improvements in practice and maybe attitudes. Previous studies reported data regarding the misdiagnosis and mistreatment status of cough in China, especially the overuse of antibiotics and overdiagnosis of chronic bronchitis [34–37], suggesting poor practice. Still, the present study is the first regarding the comprehensive KAP toward CRC in China. These results generally support the poor knowledge, favorable attitudes, and poor practice observed in the present study. The knowledge scores did not correlate with the attitude or practice scores, while the attitude scores correlated with the practice scores. These results suggest that improving knowledge might not be enough to enhance practice toward CRC but that favorable attitudes should be cultivated. Similar results were observed in respiratory and non-respiratory healthcare providers.

The present study indicated that healthcare providers had misconceptions and misunderstandings regarding the definition of chronic cough, the empirical treatment methods, and the potential risks of the treatments. Therefore, there is also a need for unified training for healthcare providers in all aspects of CRC. These results should be considered for the design of future training activities. In addition, most healthcare providers believed that CRC affects the normal work and life of the patients. Similar results were also

reported by Leuppi et al. [18]. Thus, medical staff must provide more help to the patients from the perspectives of drug treatment and psychological counseling.

In the present study, working in a respiratory department was associated with higher knowledge, probably because such physicians see more patients with CRC. More experience, job satisfaction, and formal employment were also associated with better knowledge. The attitude decreased with job satisfaction, highlighting the need to cultivate a proper work environment to improve the attitude of the physicians, especially when considering that attitude is the force driving practice [16,17]. Furthermore, the attitude scores were independently associated with the practice scores. Surprisingly, a longer experience was associated with lower practice scores, while a higher professional title was associated with higher practice scores. It should be explored in future studies.

The strengths of this study include the representative sample of healthcare providers working at a single institution. Still, this study had limitations. The generalizability of the results was relatively low since there was only one participating institution. The questions were mainly based on the Chinese guidelines [22], which could differ from Western guidelines on some points; since the participants were Chinese healthcare providers, using the Chinese guidelines is not a limitation, but it can limit the exportability of the questionnaire and the generalizability of the conclusions. Furthermore, the sample size was relatively small, considering the number of healthcare providers in China. KAP surveys also suffer from intrinsic limitations. Indeed, KAP studies are only a snapshot of the status of a specific subject in a specific population at a precise point in time. Nevertheless, the results can be used to design training activities and serve as a baseline value for determining the effect of training. In addition, KAP surveys can suffer from a social acceptability bias, i.e., the participants might be tempted to answer what they should do instead of what they really do.

In conclusion, the results suggest that healthcare providers in Yancheng had poor knowledge, favorable attitudes, and poor practice of CRC. This study identified points that should be targeted in future training and continuing education activities, especially the definition of chronic cough, empirical treatment methods, and potential risks of different treatments.

Funding

Data sharing statement

All data and analyses of this study are presented in this manuscript. Raw data can be provided upon reasonable request to the corresponding author.

CRediT authorship contribution statement

Haijue Ge: Writing – review & editing, Writing – original draft, Project administration, Methodology, Conceptualization. **Kexia Hong:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Data curation, Conceptualization. **Chuanyi Fan:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Data curation. **Jiansheng Zhang:** Validation, Methodology, Data curation. **Xia Li:** Validation, Resources, Data curation. **Hailin Zhang:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Aimin Qiu:** Visualization, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e27564.

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