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Original Article

Association of a Traditional Chinese Medicine Pilot Program with Respiratory and Psychiatric Disorders in Children with Allergic Rhinitis

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Background: The use of traditional Chinese medicine (TCM) for treating allergic rhinitis (AR) in children is on the rise, but evidence of TCM Children's Allergic Rhinitis Care Pilot Program (CARP) benefit remains limited. This study aimed to determine whether CARP treatment reduces the risk of respiratory and psychiatric disorders in children with AR, using data from the National Health Insurance Research Database (NHIRD). **Method:** We identified 11,782 children diagnosed with AR from the TCM CARP using a random sample of 2 million NHIRD beneficiaries between 2017 and 2021. Among these, 1793 TCM CARP users (who received TCM for over 30 days) and 1793 non-CARP users were randomly selected using 1:1 propensity score matched with age, sex, comorbidity, and index year. We used Cox proportional hazards regression to calculate hazard ratios (HRs) for respiratory and psychiatric disorders between the two groups. **Results:** The CARP cohort exhibited a higher risk of respiratory disorders compared to the non-CARP cohort with an adjusted HR of 1.38 (95% CI: 1.26-1.51). Conversely, the risk of psychiatric disorders was slightly higher in the CARP cohort than in the non-CARP cohort, but the difference was not statistically significant (adjusted HR = 1.11, 95% CI = 0.86-1.45). **Conclusion:** The study indicated a link between CARP involvement and specific outcomes, though it did not confirm a cause-and-effect relationship. This insight could serve as a basis for developing quantitative evaluation methods to assess the applicability of Chinese medicine guidelines and standards in future CARP initiatives.

Keywords: Allergic rhinitis, children, cohort study, respiratory diseases, psychiatric disorders

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Introduction

Allergic rhinitis (AR) is one of the most common chronic conditions globally. It often presents with recurring symptoms such as runny nose, sneezing, nasal congestion, itchy nose or eyes, and postnasal drip. A recent systematic review on the epidemiology of AR in children reported a prevalence of 10.48% for physician-diagnosed AR and 18.12% for self-reported AR within the past 12 months [1]. The prevalence of AR in Taiwan has been estimated at 10.9% in preschool children and 24.6% in school-aged children [2, 3]. If these diseases are unsuccessfully or insufficiently treated, a chronic state of inflammation, obstruction, and infection develops that can cause mucosal damage and, ultimately, chronic disease. These bothersome symptoms can significantly affect children's quality of life, leading to reduced academic performance, increased medical visits, and higher medication usage.

Current treatment strategies for AR in children include allergen avoidance, nasal irrigation, and medications such as antihistamines, nasal corticosteroids, decongestants, and leukotriene modifiers, as well as immunotherapy [4]. However, there are concerns about the side effects of these treatments. First-generation antihistamines are associated with adverse effects like cardiotoxicity, sedation, and psychomotor impairment. Additionally, the long-term use of intranasal corticosteroids in children raises safety concerns due to potential impacts on adrenocortical function, growth, and bone metabolism [5]. Although immunotherapy is considered safe and effective for treating severe AR, its use is limited by side effects such as local injection site reactions, systemic reactions like anaphylaxis, and its high cost [6].

Traditional Chinese Medicine (TCM) has been used for thousands of years to treat various diseases, including AR. TCM may offer advantages over Western medicine (WM), particularly in terms of long-term effectiveness, preventing recurrent episodes, cost-effectiveness, and safety [7]. TCM treatments for AR in children typically involve herbal medicine, acupuncture, and manipulation [8-10]. To improve the quality of care for pediatric AR, Taiwan's National Health Insurance initiated the TCM Children's Allergic Rhinitis Care Pilot Program (CARP) in 2017. CARP offers multimodal therapies including concentrated herbal medicine, acupuncture, manipulation, and patient health education.

Previous research has shown that AR in children can lead to both physical and mental health issues [11]. Studies have reported that children with AR have a 1.33-fold increased risk of psychiatric disorders such as depression, anxiety, bipolar disorder, and schizophrenia [12]. AR is also linked to respiratory conditions such as pneumonia, sinusitis, asthma, and otitis media with effusion [13, 14]. TCM has shown promise in treating AR, potentially reducing symptoms, recurrence, and immunoglobulin E (IgE) levels [15]. However, to date, no studies have specifically investigated whether the CARP program can reduce the risk of respiratory and psychiatric disorders in children with AR.

Methods

1. Data Source

Taiwan Bureau of National Health Insurance (NHI) established a universal Taiwan's Bureau of NHI established a single-payer National Health Insurance Program (NHIP) in 1995, covering over 99% of Taiwan's 23.75 million citizens (http://www.nhi.gov.

tw/english/index.aspx). The NHIP collects and stores data on demographics, disease diagnoses, medication, and treatment records in the National Health Insurance Research Database (NHIRD). Currently, the NHIRD includes nearly 30 years of medical history for Taiwan's residents. Diagnoses are coded according to the International Classification of Diseases, Ninth and Tenth Revisions, Clinical Modification (ICD-9-CM & ICD-10-CM). The study's use of data was approved by the Institutional Review Board of the Research Ethics Committee at China Medical University Hospital (CMUH110-REC1-038(CR-3)).

2. Study participants

Figure 1 outlines the process of identifying the study participants. The CARP cohort included children aged 5 to 14 years who had been diagnosed with AR (ICD-9-CM code 477; ICD-10-CM code J30) and had received CARP program for more than 30 days between January 1, 2017, and December 31, 2021. The index date was defined as the date the child joined the CARP program. The non-CARP cohort consisted of children with AR who did not participate in the TCM CARP program. For this group, a random date between 2017 and 2021 was selected as the reference index date. Children with a baseline diagnosis of respiratory (ICD-9-CM codes 381.0–486; ICD-10-CM codes J01,

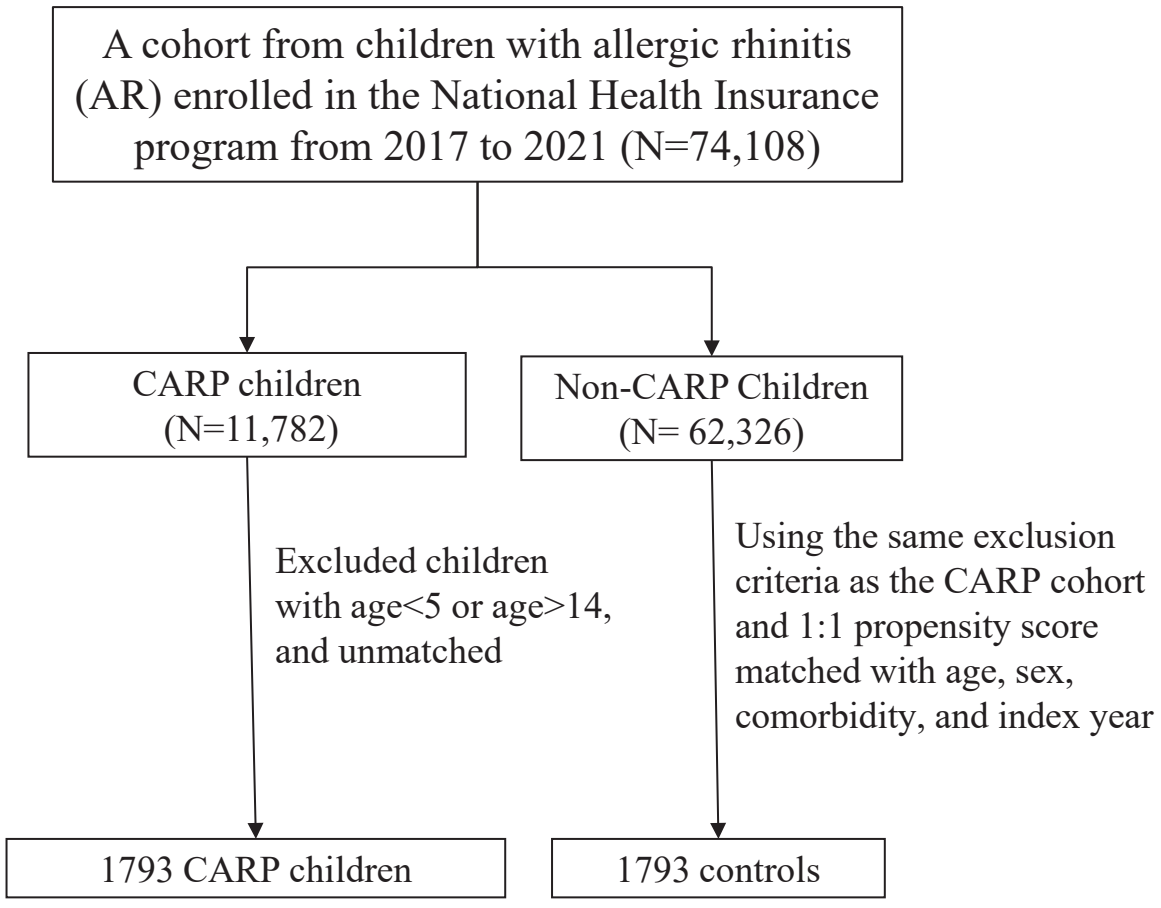

Figure 1. Flow diagram of the study

J13-J18, A37.91, A22.1, J20, J21, J31, H65-H67) or psychiatric disorders (ICD-9-CM codes 296.0–314; ICD-10-CM codes F30–F95) were not excluded; instead, baseline differences between those with and without these conditions were analyzed.

3. Outcome and Comorbidities

To track the development of respiratory complications or psychiatric disorders, claims data for all patients diagnosed with these conditions between January 1, 2017, and December 31, 2021, were analyzed. Comorbidities, including asthma (ICD-9-CM codes 493; ICD-10-CM codes J45), atopic dermatitis (ICD-9-CM codes 690.10–691.8; ICD-10-CM codes L20, L21) and nasal polyposis (ICD-9-CM codes 471.0–471.9; ICD-10-CM code J33), were defined prior to the index date.

4. Statistical analysis

The non-CARP cohort was established using the same criteria as the CARP cohort and 1:1 propensity score matched with age, sex, comorbidity, and index year. Categorical demographic characteristics and comorbidities were compared between the CARP and non-CARP cohorts using the Chi-square test, while Student's t-test was used to compare the mean ages between the two groups. Incidence density rates were calculated based on the follow-up person-

Table 1. Comparison between baseline demographic status and comorbidities of CARP cases and controls among children with allergic rhinitis

	Allergic rhinitis				
	Controls (N=1793)		CARP (N=1793)		
	n	%	n	%	*p*-value
Age, year					0.01
5-7	720	40.2	683	38.1	
8-11	626	34.9	710	39.6	
12-14	447	24.9	400	22.3	
Mean (SD)	8.91	(2.97)	8.92	(2.73)	0.94
Sex					0.97
Boy	926	51.7	927	51.7	
Girl	867	48.4	866	48.3	
Comorbidity					
Asthma	298	16.6	299	16.7	0.96
Atopic dermatitis	283	15.8	283	15.8	0.99
Nasal polyposis	24	1.34	24	1.34	0.99
History of respiratory disorder	1,741	97.1	1742	97.2	0.92
History of psychiatric disorders	134	7.47	135	7.53	0.95

Chi-square test for categorical variables; T-test for comparing means
CARP, Children's Allergic Rhinitis Care Pilot Program.

years. Incidence densities (per 1,000 person-years) for respiratory complications or psychiatric disorders were measured for each cohort overall, as well as by age, sex, and comorbidity. Univariable and multivariable Cox proportional hazards regression models were used to evaluate the effect of CARP on the risk of respiratory and psychiatric disorders, expressed as hazard ratios (HR) with 95% confidence intervals (CI). All statistical analyses were performed using SAS 9.4 software (SAS Institute, Cary, NC, USA), and a two-tailed significance level of 0.05 was applied.

Results

We identified 1,793 children with AR who participated in CARP and matched them with 1,793 non-CARP children with AR based on age, sex, comorbidity, and index year (Table 1). Both cohorts had more boys than girls, and approximately 78% of the children were aged 5 to 11 years. The mean age in both cohorts was similar (CARP: 8.92 years, SD = 2.73; non-CARP: 8.91 years, SD = 2.97). There were no significant differences between the two cohorts in the history of respiratory or psychiatric disorders.

The CARP cohort exhibited a higher incidence of respiratory complications (579.5 cases per 1,000 person-years) compared to the non-CARP cohort (404.8 per 1,000 person-years), with an adjusted HR of 1.38 (95% CI: 1.26-1.51) (Table 3). Conversely, the incidence of psychiatric disorders was slightly higher in the CARP cohort (30.5 per 1,000 person-years) than in the non-CARP cohort (27.6 per 1,000 person-years), but the difference was not statistically significant (adjusted HR = 1.11, 95% CI = 0.86-1.45) (Table 2). However, children aged 8-11 years in the CARP cohort had a significantly higher risk of psychiatric disorders

Table 2. Risk of psychiatric disorders classified by CARP, demographics, and comorbidities in the Cox risk models presented by hazard ratio (HR) and 95% CI

Variable	Event	1,000 person-years	IR	Crude		Adjusted†	
	N = 228			HR (95% CI)	P-value	HR (95% CI)	P-value
CARP							
No	108	3915	27.6	1.00		1.00	
Yes	120	3939	30.5	1.10(0.85, 1.43)	0.46	1.11(0.86, 1.45)	0.41
Age (year)							
5-7	126	3143	40.1	1.00		1.00	
8-11	68	2903	23.4	0.58(0.43, 0.78)	<0.001	0.63(0.35, 1.12)	0.12
12-14	34	1808	18.8	0.46(0.31, 0.67)	<0.001	0.62(0.21, 1.80)	0.38
Sex							

Variable	Event	1,000 person-years	IR	Crude		Adjusted†	
	N = 228			HR (95% CI)	P-value	HR (95% CI)	P-value
Boy	164	4033	40.7	1.00		1.00	
Girl	64	3821	16.8	0.41(0.31, 0.55)	<0.001	0.54(0.40, 0.72)	<0.001
Comorbidities							
Asthma							
No	184	6581	28.0	1.00		1.00	
Yes	44	1273	35.6	1.23(0.89, 1.72)	0.21	0.93(0.67, 1.30)	0.69
Atopic dermatitis							
No	192	6681	28.7	1.00		1.00	
Yes	36	1173	30.7	1.04(0.73, 1.49)	0.81	1.06(0.74, 1.51)	0.76
Nasal polyposis							
No	#	#	29.3	1.00		1.00	
Yes	#	#	15.0	0.56(0.14, 2.24)	0.41	0.66(0.16, 2.68)	0.56
History of respiratory disorder							
No	5	230	21.7	1.00		1.00	
Yes	223	7624	29.3	1.36(0.56, 3.30)	0.50	1.03(0.42, 2.51)	0.95
History of psychiatric disorders							
No	146	7465	19.6	1.00		1.00	
Yes	82	389	211.0	9.67(7.36, 12.7)	<0.001	9.78(7.36, 13.0)	<0.001

CARP, Children's Allergic Rhinitis Care Pilot Program; IR, incidence rate, per 1000 person-years; HR, hazard ratio; CI, confidence interval.

† multivariable analysis including age, sex, and comorbidities of asthma, atopic dermatitis, nasal polyposis, history of respiratory disorder, and history of psychiatric disorders.

When count values in levels of categorical variables were less than 3, they should be combined with count values in other levels or deleted to protect the privacy of beneficiaries based on Taiwan government rules.

Table 3. Risk of respiratory disorders classified by CARP, demographics, and comorbidities in the Cox risk models presented by hazard ratio (HR) and 95% CI

Variable	Event	1,000 person-years	IR	Crude		Adjusted†	
	N = 1932			HR (95% CI)	P-value	HR (95% CI)	P-value
CARP							
No	889	2196	404.8	1.00		1.00	
Yes	1043	1800	579.5	1.32(1.21, 1.45)	<0.001	1.38(1.26, 1.51)	<0.001
Age (year)							
5-7	929	1239	749.8	1.00		1.00	
8-11	659	1616	407.7	0.59(0.53, 0.65)	<0.001	0.93(0.77, 1.13)	0.48
12-14	344	1141	301.6	0.45(0.40, 0.51)	<0.001	1.17(0.82, 1.67)	0.38
Sex							
Boy	1032	1998	516.6	1.00		1.00	
Girl	900	1998	450.4	0.88(0.80, 0.96)	0.005	0.90(0.83, 0.99)	0.028
Comorbidities							
Asthma							
No	1586	3411	465.0	1.00		1.00	
Yes	346	585	591.3	1.22(1.08, 1.37)	<0.001	1.13(1.00, 1.27)	0.04
Atopic dermatitis							
No	1626	3409	476.9	1.00		1.00	
Yes	306	587	521.4	1.05(0.93, 1.19)	0.40	1.00(0.89, 1.13)	0.99
Nasal polyposis							
No	1901	3935	483.1	1.00		1.00	
Yes	31	61	508.6	1.12(0.78, 1.60)	0.54	1.06(0.74, 1.51)	0.75

Variable	Event	1,000 person-years	IR	Crude		Adjusted†	
	N = 1932			HR (95% CI)	P-value	HR (95% CI)	P-value
History of respiratory disorder							
No	34	172	197.4	1.00		1.00	
Yes	1898	3824	496.3	2.23(1.59, 3.13)	<0.001	2.59(1.85, 3.64)	<0.001
History of psychiatric disorders							
No	1793	3723	481.6	1.00		1.00	
Yes	139	273	509.3	0.99(0.83, 1.17)	0.88	1.01(0.85, 1.20)	0.90

CARP, Children's Allergic Rhinitis Care Pilot Program; IR, incidence rate, per 1000 person-years; HR, hazard ratio; CI, confidence interval.

† multivariable analysis including age, sex, and comorbidities of asthma, atopic dermatitis, nasal polyposis, history of Respiratory disorder, and history of Psychiatric disorders.

compared to the non-CARP cohort (adjusted HR = 1.87, 95% CI = 1.13-3.08) (Table 4). Additionally, Table 5 indicates that the CARP cohort exhibited a higher incidence of respiratory complications, regardless of sex or age. Regarding gender differences, girls with AR had a lower risk of developing psychiatric disorders (adjusted HR = 0.54, 95% CI = 0.40–0.72) and respiratory disorders (adjusted HR = 0.90, 95% CI = 0.83–0.99) compared to boys with AR, as shown in Table 2 and Table 3.

Discussion

This large-scale, population-based retrospective cohort study examined the association between participation in the TCM CARP program and the risk of respiratory and psychiatric disorders. Using data from the NHIRD, the key findings suggest that while CARP participation may be associated with a higher incidence of respiratory disorders, it does not significantly impact the risk of psychiatric disorders. However, a subgroup of children aged 8-11 in the CARP cohort did show a significantly increased risk of psychiatric disorders.

A chronic state of AR with nasal inflammation and obstruction develops, frequently leading to more serious complications in both the upper and the lower airways. Retrospective and prospective epidemiologic surveys have shown that allergic rhinitis is closely associated with, and may be a causative factor in, asthma, sinusitis, and otitis media with effusion [13]. Studies show that intranasal corticosteroid treatment, either alone or in combination with antihistamines, is more effective in preventing acute rhinosinusitis than antihistamines alone [16]. AR in children is also linked to an increased risk of psychiatric disorders [12], including attention deficit hyperactivity disorder

Table 4. Stratified analysis of psychiatric disorder incidence: Adjusted hazard ratios comparing CARP participants with non-participants by age, sex, and comorbidities

	CARP							
	No			Yes				
Variable	Event	PY	Rate	Event	PY	Rate	CrudeHR (95% CI)	Adjusted HR† (95% CI)
Age years								
5-7	68	1619	42.0	58	1524	38.1	0.90(0.64, 1.28)	0.88(0.61, 1.25)
8-11	24	1364	17.6	44	1539	28.6	1.61(0.98, 2.65)	1.87(1.13, 3.08)*
12-14	16	932	17.2	18	876	20.5	1.20(0.61, 2.36)	1.42(0.71, 2.83)
Sex								
Boy	79	2003	39.5	85	2030	41.9	1.06(0.78, 1.45)	1.11(0.82, 1.51)
Girl	29	1913	15.2	35	1908	18.3	1.21(0.74, 1.98)	1.27(0.77, 2.08)
Comorbidities								
Asthma								
No	88	3283	26.8	96	3297	29.1	1.09(0.81, 1.45)	1.10(0.82, 1.47)
Yes	20	632	31.6	24	641	37.4	1.16(0.64, 2.09)	1.23(0.68, 2.23)
Atopic dermatitis								
No	93	3330	27.9	99	3352	29.5	1.06(0.80, 1.40)	1.10(0.83, 1.45)
Yes	15	586	25.6	21	587	35.8	1.38(0.71, 2.67)	1.30(0.67, 2.54)

	CARP							
	No			Yes				
Variable	**Event**	**PY**	**Rate**	**Event**	**PY**	**Rate**	**CrudeHR (95% CI)**	**Adjusted HR† (95% CI)**
Nasal polyposis								
No	#	#	27.8	#	#	30.7	1.10(0.85, 1.43)	1.13(0.87, 1.46)
Yes	#	#	15.1	#	#	14.9	0.97(0.06, 15.59)	0.96(0.06, 15.55)
History of respiratory disorder								
No	3	114	26.2	#	#	17.3	0.56(0.09, 3.38)	0.39(0.05, 2.99)
Yes	105	3801	27.6	#	#	30.9	1.12(0.86, 1.45)	1.13(0.87, 1.47)
History of psychiatric disorders								
No	71	3720	19.1	75	3745	20.0	1.05(0.76, 1.45)	1.07(0.77, 1.48)
Yes	37	195	189.4	45	193	232.9	1.22(0.79, 1.89)	1.23(0.79, 1.9)

CARP, Children's Allergic Rhinitis Care Pilot Program; PY, person-years; IR, incidence rate, per 1000 person-years; HR, hazard ratio; CI, confidence interval. Adjusted HR compares CARP participants to non-participants within each stratum.

† multivariable analysis including age, sex, and comorbidities of asthma, atopic dermatitis, nasal polyposis, history of Respiratory disorder, and history of Psychiatric disorders.

*$p<0.05$

When count values in levels of categorical variables were less than 3, they should be combined with count values in other levels or deleted to protect the privacy of beneficiaries based on Taiwan government rules.

Table 5. Stratified analysis of respiratory disorder incidence: Adjusted hazard ratios comparing CARP participants with non-participants by age, sex, and comorbidities

	CARP							
	No			Yes				
Variable	Event	PY	Rate	Event	PY	Rate	CrudeHR (95% CI)	Adjusted HR† (95% CI)
Age years								
5-7	454	730	621.6	475	509	933.8	1.30(1.15, 1.48)*	1.37(1.20, 1.56)*
8-11	272	836	325.3	387	780	496.0	1.42(1.22, 1.66)*	1.44(1.24, 1.69)*
12-14	163	630	258.8	181	511	354.3	1.33(1.08, 1.65)*	1.27(1.03, 1.58)*
Sex								
Boy	480	1086	442.1	552	912	605.2	1.27(1.13, 1.44)*	1.33(1.18, 1.51)*
Girl	409	1110	368.3	491	888	553.0	1.39(1.21, 1.58)*	1.44(1.26, 1.64)*
Comorbidities								
Asthma								
No	730	1880	388.4	856	1531	559.0	1.33(1.20, 1.47)*	1.37(1.24, 1.51)*
Yes	159	317	502.1	187	269	696.5	1.29(1.04, 1.59)*	1.37(1.11, 1.70)*
Atopic dermatitis								
No	736	1905	386.4	890	1504	591.6	1.39(1.26, 1.54)*	1.45(1.32, 1.60)*
Yes	153	291	525.1	153	296	517.7	1.00(0.80, 1.25)	1.02(0.81, 1.27)
Nasal polyposis								
No	872	2165	402.7	1029	1770	581.3	1.33(1.22, 1.46)*	1.38(1.26, 1.51)*
Yes	17	31	546.5	14	30	469.1	0.94(0.46, 1.91)	0.82(0.39, 1.72)
History of respiratory disorder								
No	21	75	281.8	13	98	133.1	0.52(0.26, 1.05)	0.53(0.26, 1.08)
Yes	868	2122	409.1	1030	1702	605.1	1.35(1.24, 1.48)*	1.39(1.27, 1.53)*

Variable	CARP						CrudeHR (95% CI)	Adjusted HR† (95% CI)
	No			Yes				
	Event	PY	Rate	Event	PY	Rate		
History of psychiatric disorders								
No	828	2051	403.6	965	1672	577.2	1.32(1.21, 1.45)*	1.38(1.25, 1.51)*
Yes	61	145	421.1	78	128	609.1	1.31(0.94, 1.83)	1.25(0.89, 1.75)

CARP, Children's Allergic Rhinitis Care Pilot Program; PY, person-years; IR, incidence rate, per 1000 person-years; HR, hazard ratio; CI, confidence interval. Adjusted HR compares CARP participants to non-participants within each stratum.

† multivariable analysis including age, sex, and comorbidities of asthma, atopic dermatitis, nasal polyposis, history of Respiratory disorder, and history of Psychiatric disorders.

*$p<0.05$

(ADHD) [17]. The severity and duration of AR may influence the severity of ADHD symptoms [17], and AR treatment has shown promise in helping children with ADHD who do not respond to conventional therapies [18]. Some research suggests that children with ADHD and allergic diseases may share a common biological background [19]. Cognitive impairment during peak allergy seasons, such as ragweed season, may be explained by allergic triggers causing neuroimmune inflammation, which affects the central nervous system (CNS), or by CNS stimuli such as stress or anxiety worsening allergic inflammation [19]. However, the mechanisms linking AR and ADHD remain unclear and warrant further study [17].

TCM is widely used in Taiwan to treat AR, with about 45% of AR patients utilizing TCM therapies [20]. TCM treatments for AR in children include Chinese herbal medicine (CHM), acupuncture, manipulation, fumigation, acupoint herbal patch (AHP), and health education. Studies indicate that combining pediatric manipulation with WM, acupuncture, and TCM is more effective than using a single therapy to treat systemic pediatric diseases [21]. Pediatric tuina, a form of TCM manual therapy, enhances circulation, strengthens immunity, and helps stabilize psycho-behavioral issues [22, 23]. Clinical research also shows that AHP can prevent asthma attacks, alleviate AR symptoms, and modulate inflammatory cytokines during allergy seasons [24]. Additionally, TCM fumigation, where concoctions of herbal formulas like Ma Huang Fuzi Xixin Decoction are inhaled, has been shown to be effective for AR patients [25, 26]. Another key aspect of CARP is integrated patient health education, which combines WM and TCM approaches, helping patients maintain their health and adapt to environmental changes through lifestyle choices, diet, and self-

massage of meridians to boost qi and regulate the immune system [27-29].

This study found that patients receiving CARP treatment did not experience a significant reduction in risk, and in fact, the risk of respiratory disorders was even higher. This finding raises important questions about the health outcomes of children with AR participating in CARP programs. Based on a review of the existing literature, it's unlikely that the CARP program itself caused these issues. A more plausible explanation is selection bias. Children in the CARP cohort are often not representative of the broader population of children with AR. Research indicates that families of children with chronic conditions or illnesses tend to be more proactive in seeking specialized healthcare [30] and enrolling in programs like CARP. These families may be more vigilant about their child's health, leading to a higher likelihood of seeking medical attention for respiratory problems. Consequently, this could result in increased detection of respiratory disorders within the CARP cohort, rather than a true higher incidence. Additionally, children with more severe or poorly controlled AR may be more inclined to join CARP, making the cohort inherently more susceptible to respiratory complications, independent of their participation in the program. To address these issues, future research should include more detailed baseline assessments of AR severity, utilizing validated tools such as the Rhinitis Control Assessment Test [31] and a visual analog scale for AR severity. Meanwhile, with strong support from the National Union of Chinese Medical Doctor's Association, significant advancements have been made in TCM-related NHI projects for specific diseases in recent years. However, the standardization of TCM faces challenges due to its relatively late start, including unclear principles, inadequate methods, insufficient standards, and a shortage of skilled professionals. These factors can lead to inconsistent treatment efficacy. To address these challenges, more scholars will need to contribute to the foundational principles of standardization, drawing on the wisdom of traditional culture and the unique characteristics of TCM.

The observed rise in psychiatric risk among the 8- to 11-year-old CARP subgroup requires careful attention and further exploration. Several research directions could help clarify this finding. First, the 8-11 age range is a critical period for social and emotional development, where peer relationships, academic performance, and self-esteem become increasingly significant. Children with chronic conditions may encounter difficulties in these areas, making them more susceptible to mental health challenges [32]. Additionally, children in this age group may face heightened stress related to managing their AR. Families of children with chronic illnesses often experience increased stress and strain, which can influence family dynamics and potentially contribute to mental health issues in children [30]. Studies suggest that the stress associated with chronic illness can have a substantial impact on mental well-being during this developmental stage [30, 32]. Thus, participation in CARP may reflect families actively seeking solutions for their children's health concerns, potentially signaling elevated parental anxiety and subsequent stress on the child.

The strengths of this study include its use of a comprehensive national database, minimizing recall bias, and the use of a multivariate adjusted hazard ratio to assess CARP's association with AR and the risk of respiratory and psychiatric disorders. However, several limitations must be considered. First, data on AR

severity, daily symptoms, IgE levels, body mass index, medical compliance, lifestyle, and environmental factors such as allergens, air pollution, and tobacco smoke exposure were not available in detail through NHIRD claim data, which may have led to biased risk estimates. Second, our study's CARP cohort lacks information regarding the concurrent use of WM. Third, the study did not analyze other forms of TCM use, such as other NHI-reimbursed herbal remedies, folk medicine, and treatments purchased directly from herbal pharmacies. This may have underestimated the overall use of TCM and therefore potentially masked its true effectiveness.

Conclusion

This study highlights significant questions about the health outcomes of children with AR who participate in CARP. Although the study identifies an association between CARP participation and specific outcomes, it is important to stress that this does not imply causation. The research cannot definitively determine that CARP participation directly causes these outcomes. Future studies should focus on exploring the underlying reasons for these observed associations, taking into account potential confounding factors. Such investigations will be critical for gaining a deeper and more nuanced understanding of the complex relationship between program participation and child health outcomes in this population.

CRediT authorship contribution statement

Chun-Ting Liu: Writing – original draft, Visualization, Formal analysis. Bei-Yu Wu: Visualization, Validation. Cheng-Li Lin: Validation, Formal analysis, Data curation. Ming-Yen Tsai: Writing – review & editing, Methodology, Project administration, Supervision, Conceptualization. All authors collaborated in writing the final version of the manuscript. All authors read and approved of the final manuscript.

Ethical statement

This research was reviewed and approved by the institutional review board of the Research Ethics Committee of China Medical University Hospital [CMUH110-REC1-038(CR-3)].

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原始論文

兒童過敏性鼻炎中醫照護計畫和呼吸道及精神疾病的關聯

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背景：兒童過敏性鼻炎使用中醫治療的比例日益增加，但中醫兒童過敏性鼻炎照護試辦計畫的療效證據仍然有限。本研究旨在利用全國健康保險研究資料庫的數據，探討此計畫是否能降低過敏性鼻炎兒童呼吸道和精神疾病的風險。**方法：**從全民健康保險研究數據庫中隨機抽樣，納入 2017 至 2021 年參與中醫兒童過敏性鼻炎照護試辦計畫的 11,782 名兒童，確定了 1793 名試辦計畫使用者，並根據年齡、性別、共病和指標年份進行匹配，隨機選擇 1793 名兒童為對照組。使用 Cox 比例風險回歸模型計算兩組之呼吸道和精神疾病的風險比。**結果：**計畫組的呼吸道疾病風險高於非計畫組，調整後的風險比為 1.38（95% CI: 1.26-1.51）。相反地，計畫組的精神疾病風險略高於非計畫組，但差異無統計學意義（調整後風險比 = 1.11，95% CI = 0.86-1.45）。**結論：**研究結果顯示參與中醫兒童過敏性鼻炎照護試辦計畫與特定結果有關，但並未證實因果關係。此發現可提供兒童過敏性鼻炎照護試辦計畫未來制定中醫指導原則和標準適用性的量化評估方法的參考。

關鍵字：過敏性鼻炎、兒童、世代研究、呼吸道疾病、精神疾病

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