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The prevalence and associated lifestyle risk factors of self-reported allergic rhinitis in Kazakh population of Fukang City

Yuping Yang, PhD, Yan Wang, MS, Liang Lv, MS, Yong Sun, BS, Cheng Li, BS, Yuqin Fan, PhD, Juan Feng, PhD, Hua Zhang, PhD*, Jun Yong, MS

Abstract

This study is to analyze the prevalence and the associated lifestyle risk factors of self-reported allergic rhinitis (AR) in Kazakh population of Fukang City.

A cross-sectional study was conducted using stratified random sampling method and 1689 Kazak people were surveyed. A standard questionnaire was used for face-to-face interview.

The prevalence of self-reported AR of Kazakh population in Fukang City was 13.7%, and sneezing was the most common symptoms (54.6%) with no significant differences among age, sex, and weight. The incidence of asthma in Kazakh people was correlated with age, and the incidence of allergies in Kazakh people was correlated with weight. Skin pruritus was the most common symptom for allergy (42.7%). The AR incidence was correlated with sinusitis and asthma, and was mostly associated with carpet use. For diet, the AR incidence was positively correlated with meat and fruit, and negatively correlated with beans and milk.

The prevalence of AR is high among Kazakh people in Fukang City, and its incidence is closely related with lifestyle risk factors such as carpet use and meat and fruit consumption.

Abbreviations: AR = allergic rhinitis, ARIA = allergic rhinitis and its impact on asthma, CI = confidence interval, Ig = immunoglobulin, OR = odds ratio.

Keywords: allergic rhinitis, epidemiology study, Kazak

1. Introduction

From the perspective of allergy, allergic rhinitis (AR) is a noninfectious nasal mucosa inflammation that is mediated by immunoglobulin (Ig) E.[1] AR is the specific inflammation against allergen by immune defense cells on nasal mucosa, which can lead to chronic nasal symptoms such as sneezing, itching, runny nose, and nasal congestion.[2] For patients with intermittent episodes, the symptoms are generally mild with short duration, and can be controlled by local and/or systemic medications with less effect on quality of life.[3] For patients with consistent attack, the life quality is generally low and long-term medications are required. However, due to the poor drug efficacy, immune suppression therapy is generally needed.[4]

The AR prevalence in Urumqi was high, and ranked the first among 11 cities surveyed across China.[5] So far, there is no effective intervention to decrease the high prevalence. In a longitudinal study on the relationship between AR/ non-AR and asthma in Western Europe involving more than 6000 subjects, it showed that AR and non-AR were both risk factors for asthma.[6] Epidemiology studies have showed that patients usually have asthma and rhinitis in the meantime and about one-third of AR patients would concurrently have asthma.[7–9] AR and asthma share the similar family characteristics and familial risk.[10] Therefore, information on the AR population prevalence and AR lifestyle risk factors is essential for the early diagnosis and intervention of AR.

In this study, a cross-sectional study of the prevalence of self-reported AR and the associated lifestyle risk factors was performed in Kazakh population of Fukang City, Xinjiang, China.

2. Methods

2.1. Subject selection and sampling

A cross-sectional survey was conducted using multistage stratified cluster sampling method. Two towns were randomly selected in Fukang City, and 2 streets were randomly selected in each town. Then, 2 communities were randomly selected on each pre-selected street. Of the 8 selected communities, 65 households were selected, and all surveyed households have resided in the area for more than 2 years. Prior written and informed consent were obtained from every subject and the study was approved by the ethics review board of the First Affiliated Hospital of Xinjiang Medical University.

Editor: Fateh Rahimi.

Funding/support: This work was supported by China National Natural Science Foundation (No. 81160125 and No. 81570896).

The authors have no conflict of interest.

Department of Ear, Nose and Throat, the First Affiliated Hospital of Xinjiang Medical University, Urumqi, P.R. China.

** Correspondence: Hua Zhang, Department of Ear, Nose and Throat, the First Affiliated Hospital of Xinjiang Medical University, No. 1, Liyushan Road, Urumqi 830054, P.R. China (e-mail: 978288587@qq.com).*

Medicine (2017) 96:39(e8032)

Received: 7 April 2017 / Received in final form: 10 August 2017 / Accepted: 17 August 2017

http://dx.doi.org/10.1097/MD.0000000000008032

Table 1

Baseline information of Kazakh people.

Symptoms		AR				
	No	Yes		Percentage (%)	X^2	*P*
Running nose	No	1295	115	43.90 (90/205)	597.07	.00*
	Yes	0	90			
Sneezing	No	1290	93	54.60 (112/205)	724.23	.00*
	Yes	5	112			
Nasal congestion	No	1287	125	39.02 (80/205)	472.73	.00*
	Yes	8	80			
Nose pruritus	No	1290	94	54.10 (111/205)	716.88	.00*
	Yes	5	111			
Eye irritation	No	1287	141	31.21 (64/205)	362.70	.00*
	Yes	8	64			
Interference on quality of life	No	1278	55	26.82 (55/205)	634.55	.00*
	Mild	2	30	14.63 (30/205)		
	Modest	10	69	33.66 (69/205)		
	Severe	5	30	14.63 (30/205)		
	Extremely severe	0	21	10.24 (21/205)		
Total		1295	205			

AR = allergic rhinitis.
* $P < .05$ was considered statistically significant.

2.2. Household data collection

All investigators received standard training before the survey. The questionnaire was developed on the basis of Global Allergy and Asthma European Network (GA2LEN).[11] The surveyed factors mainly included symptoms and lifestyle factors of AR, asthma, and other allergies. The diagnosis of AR was in accordance with previous national epidemiology surveys 2010 Allergic Rhinitis and its Impact on Asthma (ARIA) standard.[12] All individuals were interviewed personally, or by the family if the individual was absent from home and the family signed for representation.

2.3. Statistical analysis

Data were analyzed by SPSS17.0 (SPSS Inc, Chicago, IL). Quantitative data were analyzed by Chi-square test. The odds ratio (OR) and corresponding 95% confidence intervals (95% CIs) was calculated. $P \leq .05$ was considered statistically significant.

3. Results

3.1. General characteristics

There were 1689 people identified and 1500 questionnaires were qualified. Of them, 205 people were diagnosed of AR, and the AR prevalence was 13.7%. The effect of AR on life quality of Kazakh AR patients was moderate. Among typical AR symptoms, sneezing had the highest incidence (54.60%), followed by nose pruritus (54.10%), runny nose (43.90%), nasal congestion (39.02%), and eye irritation (31.21%) (Table 1). There were no significant differences in age and gender among Kazakh AR patients, and there was no difference in weight and height for AR susceptibility. It indicated that there were no differences in population general characteristics between AR patients and healthy controls.

3.2. AR symptoms

To determine the comorbidity of AR and asthma, the incidence of AR with asthma was examined. It showed that the incidence of AR with asthma increased with age (Table 2). The lower airway symptoms presented as paroxysmal chest tightness and cough (39.5–43.8%), followed by suffocation (21%) and wheezing (8.8%). The majority onset of asthma was associated with flu (40%) (Table 3).

In addition, there were significant differences in weight for AR patients with other allergies, who were disproportionally overweight or obese. For other allergies, skin pruritus was the most common (42.7%), followed by edema and allergy shock (6.7%) (Table 4).

3.3. AR complications

The AR complications were analyzed. As summarized in Table 5, the majority of AR patients were complicated with local tenderness and hyposmia with statistical significance ($P = .00 < .05$). For AR patients with asthma, the main complication was

Table 2

Characteristics and analysis of Kazakh people with asthma.

		Age, y				Gender		BMI			
		1–20	20–30	30–50	>50	Male	Female	Underweight	Normal	Overweight	Obese
Asthma	Yes	14	22	31	47	50	64	12	24	35	43
	No	282	409	390	305	604	782	170	363	480	373
X2		23.91				0.00		6.25			
P		.00*				.95		.10			

AR = allergic rhinitis, BMI = body mass index.
* $P < .05$ was considered statistically significant.

Table 3

Characteristics and analysis of Kazakh people with lower airway symptoms.

		Asthma				
		No	Yes	Percentage (%)	X^2	*P*
Suffocation	No	1386	90	21.05 (24/114)	283.31	.00*
	Yes	0	24			
Wheezing	No	1386	104	8.77 (10/114)	109.51	.00*
	Yes	0	10			
Chest tightness	No	1386	64	43.86 (50/114)	615.32	.00*
	Yes	0	50			
Cough	No	1386	69	39.47 (45/114)	550.54	.00*
	Yes	0	45			
Nighttime wakenings	No	1384	85	25.44 (29/114)	320.98	.00*
	Yes	2	29			
Followed "flu"	No	1384	73	35.96 (41/114)	472.62	.00*
	Yes	2	41			
Combined with AR	No	1384	93	18.42 (21/114)	221.10	.00*
	Yes	2	21			
Total		1386	114			

AR = allergic rhinitis.
* $P < .05$ was considered statistically significant.

Table 4

Characteristics and analysis of Kazakh people with allergies.

		Allergies				
Symptoms		No	Yes	Percentage (%)	X^2	*P*
Rash	No	1425	43	42.60 (32/75)	621.25	.00*
	Yes	0	32			
Edema	No	1425	70	6.67 (5/75)	76.31	.00*
	Yes	0	5			
Vomit	No	1425	68	9.30 (7/75)	114.29	.00*
	Yes	0	7			
Diarrhea	No	1425	70	6.67 (5/75)	76.31	.00*
	Yes	0	5			
Abdominal pain	No	1425	70	6.67 (5/75)	76.31	.00*
	Yes	0	5			
Low blood pressure	No	1425	70	6.67 (5/75)	76.31	.00*
	Yes	0	5			
Syncope	No	1425	69	8.00 (6/75)	95.26	.00*
	Yes	0	6			
Total		1425	75			

AR = allergic rhinitis.
* $P < .05$ was considered statistically significant.

Table 5

The AR complications among AR Kazakh people.

		AR				Asthma				Allergy			
Complications		No	Yes	X^2	*P*	No	Yes	X^2	*P*	No	Yes	X^2	*P*
Local tenderness	No	1288	190	56.24	.00*	1366	109	5.57	.02*	1406	70	12.87	.00*
	Yes	7	15			20	5			19	5		
Nose pus	No	1291	198	19.38	.00*	1375	104	12.88	.00*	1420	70	42.92	.00*
	Yes	4	7			11	10			5	5		
Hyposmia	No	1288	192	45.27	.00*	1373	109	10.56	.00*	1411	70	18.41	.00*
	Yes	7	13			13	5			14	5		
Use of nasal spray	No	1291	198	19.38	.00*	1380	105	22.61	.00*	1420	70	42.92	.00*
	Yes	4	7			6	9			5	5		
In total		1295	205			1386	114			1425	75		

AR = allergic rhinitis.
* $P < .05$ was considered statistically significant.

Table 6

Correlation of carpet use with AR for Kazakhs.

		Paired difference						
					95% CI			
	Carpet usage (%)	Mean	Standard error	Correlation	Lower limit	Upper limit	*t*	Significance (2-sided)
AR	94.40%	−0.080	0.43	0.55	−0.102	−0.058	−7.268	0.00*

AR = allergic rhinitis.
* $P < .05$ was considered statistically significant.

nose pus and use of nasal spray with statistically significance ($P < .05$). However, there was no significant difference among AR patients with other allergies.

3.4. Lifestyle factors

To determine the lifestyle factors contributing to AR among Kazakhs, information on their lifestyle factors was collected. By analyzing lifestyle factors and dietary habits, it is found that 94.4% of Kazakh AR patients used carpet, and carpet use was correlated with the incidence of AR (Table 6). Carpet may contain a large number of mites, mold, and dust, which are common allergens implicated with AR, especially the perennial AR.[13] In addition, it is found that the consumption of meat, fruit, milk, and beans was also correlated with AR. Intake of meat (0.739) and fruits (0.658) was positively correlated with AR, while milk (−0.408) and beans (−0.453) were negatively correlated with AR (Table 7). Moreover, as summarized in Table 8, more than 90% of the Kazakh had stomach symptoms, which included all AR patients. About 88.9% of the Kazak AR patients earned a monthly income of less than 3000 Yuan on average. The education levels of AR patients' parents were lower than non-AR patients' parents, while most AR patients were of high school and college degree. Due to religious reasons, the smoking rate was low for Kazakh people, and no association was found between smoking and allergic airway inflammation.

4. Discussion

AR is a common clinical illness and a global challenge. AR is an IgE-mediated nasal inflammatory disease that is triggered by contact of allergen[14,15] and is featured as eosinophilic inflammation.[16] However, many clinical issues of AR remained unresolved, such as the immunological detection for AR diagnosis[17,18] and limited use of evidence-based treatment guidelines.[19–21]

There are epidemiology studies on AR prevalence in major cities across China[5]; however, they were conducted by telephone. Hence, this information had limited accuracy, and face-to-face interview is needed, especially for lifestyle information. In this study, Kazakhs were surveyed, whose population size was only second to the Uighur among minorities in Xinjiang, and it was found in baseline survey that Kazakhs were more susceptible to airway allergic diseases. In addition, epidemiology information on Kazakhs was seldomly collected and reported; thus, AR information gathered from this study would greatly benefit future AR epidemiology study and AR prevention.

There are many differences in lifestyle, dietary, and genetic factors between minority groups and Hans. Much effort has been made on the differences of *AR* gene susceptibility between Han and minority groups.[22,23] Clinically, it is found that Kazakh people are more prone to upper respiratory tract allergies than other ethnic groups; however, no scientific research has been conducted to provide the actual statistics. This study is the first to provide baseline of AR-related information of Kazakh population, including the disease, economic burden, and the relationship between lifestyle and AR pathogenesis.

The study is limited in the language barrier between Kazakhs and Han, the small population size of Kazakh, and the lack of nasal inspection. However, Kazakh clinicians were included in the design to overcome the language barrier, and the study used

Table 7

Correlation of dietary habits and AR for Kazakhs.

	Nonstandardized coefficients				Correlation		
Dietary types	β	Standard error	*t*	Significance	Zero order	Partial correlation coefficient	Partial correlation coefficient
Normal	0.57	0.56	1.02	0.32			
Vitamin	−0.15	0.29	−0.51	0.61	0.10	−0.10	−0.05
Fast food	0.21	0.18	1.18	0.25	0.07	0.21	0.11
Ice	−0.06	0.11	−0.53	0.60	−0.05	−0.10	−0.05
Juice	−0.05	0.09	−0.60	0.55	−0.13	−.11	−.06
Tea	−0.01	0.04	−0.38	0.71	0.05	−0.07	−0.04
Coffee	0.02	0.05	0.36	0.72	0.17	0.07	0.03
Milk	−0.10	0.04	−2.41	0.02	−0.05	−0.41	−0.22
Egg	−0.05	0.07	−0.72	0.48	−0.35	−0.13	−0.07
Bean	−0.16	0.06	−2.74	0.01	−0.48	−0.45	−0.25
Fruit	0.22	0.05	4.71	0.00*	0.11	0.66	0.43
Vegetables	−0.10	0.10	−1.08	0.29	−0.34	−0.20	−0.10
Pork	0.30	0.05	5.91	0.00*	0.60	0.74	0.54
Seafood	0.02	0.07	0.29	0.78	−0.17	0.05	0.03

AR = allergic rhinitis.
* $P < .05$ was considered statistically significant.

Table 8

Education, income, and stomach symptoms among AR Kazakh people.

		Nasal congestion				
		No	Yes	Percentage (%)	X^2	*P*
Education	Primary school	290	44	21.46	2.75	.43
	Junior high school	286	47	22.92		
	High school	353	61	29.76		
	College or above	366	53	25.85		
Father's education	Illiteracy	180	24	11.71	14.64	.01*
	Primary school	472	60	29.27		
	Junior high school	125	34	16.59		
	High school	412	72	35.12		
	College or above	106	15	51.70		
Mother's education	Illiteracy	169	24	11.71	14.04	.01*
	Primary school	491	63	30.73		
	Junior high school	81	32	15.61		
	High school	449	65	31.71		
	College or above	105	21	51.20		
Monthly income, yuan	<3000	1039	182	88.78	2.71	.00*
	≥3000	256	23	11.22		
Stomach symptoms (acid reflux, etc)	Mild	116	9	4.39	7.84	.02*
	Moderate	1099	172	83.90		
	Severe	80	24	11.71		

AR = allergic rhinitis.

* $P < .05$ was considered statistically significant.

carefully designed sampling to minimize the selection bias. In the future, studies are needed with larger sample size and better study design to further examine the pathogenesis of AR for minorities in China.

Acknowledgments

We thank all members from Department of Allergy and Department of Ear, Nose and Throat in the First Affiliated Hospital of Xinjiang Medical University for their help in data collection. We also thank Dr. Yong Sun (from Department of Preventative Care, the First Affiliated Hospital of Xinjiang Medical University) and Cheng Li (from Department of Information, the First Affiliated Hospital of Xinjiang Medical University) for their valuable help. We thank all community staff from Fukang City for their support to this study.

References

[1] Salo PM, Calatroni A, Gergen PJ, et al. Allergy-related outcomes in relation to serum IgE: results from the National Health and Nutrition Examination Survey 2005–2006. J Allergy Clin Immunol 2011;127: 1226–35.

[2] Anolik R. Mometasone Furoate Nasal Spray With Loratadine Study GroupClinical benefits of combination treatment with mometasone furoate nasal spray and loratadine vs monotherapy with mometasone furoate in the treatment of seasonal allergic rhinitis. Ann Allergy Asthma Immunol 2008;100:264–71.

[3] Wallace DV, Dykewicz MS, Bernstein DI, et al. The diagnosis and management of rhinitis: an updated practice parameter. J Allergy Clin Immunol 2008;122:S1–84.

[4] Seidman MD, Gurgel RK, Lin SY, et al. Clinical practice guideline: allergic rhinitis executive summary. Otolaryngol Head Neck Surg 2015;152:197–206.

[5] Han DM, Zhang L, Huang D, et al. Self-reported prevalence of allergic rhinitis in eleven cities in China. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 2007;42:378–84.

[6] Shaaban R, Zureik M, Soussan D, et al. Rhinitis and onset of asthma: a longitudinal population-based study. Lancet 2008;372:1049–57.

[7] Bousquet J, Schünemann HJ, Samolinski B, et al. Allergic rhinitis and its impact on asthma (ARIA): achievements in 10 years and future needs. J Allergy Clin Immunol 2012;130:1049–62.

[8] Groot EP, Nijkamp A, Duiverman EJ, et al. Allergic rhinitis is associated with poor asthma control in children with asthma. Thorax 2012; 67: 582–7.

[9] Oka A, Matsunaga K, Kamei T, et al. Ongoing allergic rhinitis impairs asthma control by enhancing the lower airway inflammation. J Allergy Clin Immunol Pract 2014;2:172–8.

[10] Chen M, Jiang WJ. Individual status, genetics, environment and childhood asthma: a meta-analysis of case-control studies in recent ten years in China. China Med Pharm 2011;1:16–8.

[11] Hastan D, Fokkens WJ, Bachert C, et al. Chronic rhinosinusitis in Europe: an underestimated disease. A GA2LEN study. Allergy 2011;66: 1216–23.

[12] Brozek JL, Bousquet J, Baena-Cagnani CE, et al. Allergic rhinitis and its impact on asthma (ARIA) guidelines: 2010 revision. J Allergy Clin Immunol 2010;126:466–76.

[13] Karra L, Haworth O, Priluck R, et al. Lipoxin B4 promotes the resolution of allergic inflammation in the upper and lower airways of mice. Mucosal Immunol 2015;8:852–62.

[14] Subspecialty Group of Rhinology, Editorial Board of Chinese Journal of Otorhinolaryngology Head and Neck Surgery Subspecialty Group of Rhinology and Pediatrics, Society of Otorhinolaryngology Head and Neck Surgery: Chinese Medical Association, Editorial Board of Chinese Journal of PediatricsGuidelines for diagnosis and treatment of pediatric allergic rhinitis (2010, Chongqing). Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 2011;46:7–8.

[15] Togias A. Unique mechanistic features of allergic rhinitis. J Allergy Clin Immunol 2000;105:599–604.

[16] Gu ZY, Li Y. Allergology in ear nose throat head and neck diseases: People's Health Publishing House. Beijing 2012;36:55–174.

[17] Zhang L, Wei J, Han D. Current state of diagnosis and treatment of allergic rhinitis in China. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 2010;45:420–3.

[18] Ryu JH, Yoo JY, Kim MJ, et al. Distinct TLR-mediated pathways regulate house dust mite–induced allergic disease in the upper and lower airways. J Allergy Clin Immunol 2013;131:549–61.

[19] Subspecialty Group of Rhinology, Editorial Board of Chinese Journal of Otorhinolaryngology Head and Neck Surgery Subspecialty Group of Rhinology, Society of Otorhinolaryngology Head and Neck Surgery: Chinese Medical AssociationGuidelines for diagnosis and treatment of allergic rhinitis (2009, Wuyishan). Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 2009;44:977–8.

[20] Nathan RA, Eccles R, Howarth PH, et al. Objective monitoring of nasal patency and nasal physiology in rhinitis. J Allergy Clin Immunol 2005;115:S442–459.
[21] Rochat MK, Illi S, Ege MJ, et al. Allergic rhinitis as a predictor for wheezing onset in school-aged children. J Allergy Clin Immunol 2010;26:170–5.
[22] Cui Z, Zhang H, Liu Y, et al. Analysis of HLA-DQB1 polymorphism for patienets with allergic rhinitis of Uygur and Han people in Xinjiang. Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 2011;25:645–8.
[23] Chen QY, Yang YP, Xiang YB, et al. Relationship between TAP1 *rs2071480 gene polymorphisms and allergic rhinitis in the Chinese Han population in Xinjiang. J Med Postgrad 2012;25:805–9.