Available online at www.sciencedirect.com

ScienceDirect

Journal of the Chinese Medical Association 81 (2018) 708–713

www.jcma-online.com

Original Article

Population-based comparison of traditional medicine use in adult patients with allergic rhinitis between South Korea and Taiwan

Ching-Wen Huang [a,b,c], I-Hsuan Hwang [d], Young-Hee Yun [i,j], Bo-Hyoung Jang [a,c,*], Fang-Pey Chen [e,f,**], Shinn-Jang Hwang [g,h], Seong-Gyu Ko [a,b,c]

[a] *Institute of Safety, Efficacy and Effectiveness Evaluation for Korean Medicine, Kyung Hee University, Seoul, South Korea*
[b] *Department of Science in Korean Medicine, Graduate School, Kyung Hee University, Seoul, South Korea*
[c] *Department of Preventive Medicine, College of Korean Medicine, Kyung Hee University, Seoul, South Korea*
[d] *Quality of Care and Patient Safety Committee, Cheng-Hsin General Hospital, Taipei, Taiwan, ROC*
[e] *Department of Traditional Medicine, Taipei Veterans General Hospital, Taipei, Taiwan, ROC*
[f] *Research Institute of Traditional Medicine, National Yang-Ming University School of Medicine, Taipei, Taiwan, ROC*
[g] *Department of Family Medicine, Taipei Veterans General Hospital, Taipei, Taiwan, ROC*
[h] *Department of Family Medicine, National Yang-Ming University School of Medicine, Taipei, Taiwan, ROC*
[i] *Chung-Yeon Medical Institute, Seoul, South Korea*
[j] *Research and Development Institute, CY Pharmaceutical Co.'Ltd., Seoul, South Korea*

Received April 11, 2017; accepted December 12, 2017

Abstract

Background: As the number of people seeking to use traditional medicine to treat common diseases is increasing worldwide, the quantity of information that needs to be analyzed is also increasing. Traditional medicine is commonly used in South Korea and Taiwan for treating allergic rhinitis and is covered by the National Health Insurance in both countries. To date, there has been no nationwide comparison of traditional medicine used to treat patients with allergic rhinitis between these two countries.

Methods: This study analyzed the National Health Insurance cohort database in 2011 from South Korea and Taiwan to compare the utilization pattern of traditional medicine in adult patients with allergic rhinitis.

Results: During 2011, there were significantly more adult patients with allergic rhinitis using traditional medicine in Taiwan (9898/54,555, 18.1%) than in South Korea (533/11,761, 0.5%). Users of traditional medicine from both countries were more prevalent among women, the younger population aged 20–39 years, and among people who visited traditional medicine clinics more frequently than hospitals. The most common traditional medicine treatment modality for allergic rhinitis was acupuncture in South Korea, while powdered herbal preparations was most commonly used in Taiwan. *Xiaoqinglong-tang (Socheongryongtong-tang)* was the most commonly used herbal preparation in South Korea, while *Xinyi-san (Sinyi-san)* was the most commonly prescribed herbal preparation in Taiwan.

Conclusion: An analysis of the National Health Insurance database of South Korea and Taiwan revealed different utilization patterns of traditional medicine in adult patients with allergic rhinitis between the two countries. We believe these phenomena are due to the difference in the national healthcare systems in both countries.

Keywords: Acupuncture; Allergic rhinitis; Herbal medicine; National health insurance database; Traditional medicine

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

* Corresponding author. Dr Bo-Hyoung Jang, Department of Preventive Medicine, College of Korean Medicine, Kyung Hee University, 26, Kyungheedae-ro, Hoegi-dong, Dongdaemun-gu, 130-701, Seoul, South Korea.

** Corresponding author. Dr Fang-Pey Chen, Department of Traditional Medicine, Taipei Veterans General Hospital, 201, Section 2, Shi-Pai Road, Taipei 112, Taiwan, ROC.

E-mail addresses: bhjang@khu.ac.kr (B.-H. Jang), fpchen@vghtpe.gov.tw (F.-P. Chen).

https://doi.org/10.1016/j.jcma.2017.12.008

1. Introduction

Allergic rhinitis (AR) is a common allergic disorder observed in clinical practice. More than 400 million people suffer from AR worldwide.[1,2] Although AR is not a serious disease, it can be profoundly detrimental to a patient's quality of life, affecting school learning and even work performance.[3] The increasing number of patients with AR combined with its close association with asthma has piqued the attention of people worldwide.[4] In Asia–Pacific countries, the reported prevalence of AR varies widely (from 5% to 45%) but has consistently been observed to be rising.[5]

In Western medicine (WM), the common treatment modalities for AR are anti-histamine and immuno-modulatory drugs, hypo-sensitization, and surgery.[6] However, a number of people have observed that such treatments, when used alone, do not control their symptoms well.[7,8] Furthermore, several researchers have claimed that integrating traditional medicine (TM) with WM leads to a better outcome than the use of WM alone.[9,10] Finally, the side effects associated with WM have urged more patients with AR to seek alternative treatments, such as TM.[11] TM represents a new trend in healthcare that has become increasingly popular globally.[12] Moreover, in Asian countries, such as South Korea, Taiwan, Japan, and China, TM is not simply seen as an alternative therapy but as the primary treatment for some diseases.[13] Prompted by this trend, investigators are using various research methods to confirm both the safety and efficacy of TM.[3] Many clinical studies evaluating TM to treat AR have been carried out.[14] According to a systematic review in 2012, there were 266 clinical trials using Chinese herbal medicine to treat AR from 1999 to 2011.[15]

In a recapitulation of this trend, more recent studies have addressed the importance of TM in treating AR. For instance, one investigation, first published in 2007, used the National Health Insurance (NHI) database of Taiwan to identify the pattern of TM use in patients with AR.[16]A more recent study used the Taiwanese NHI database to describe the pattern of TM use in children with AR.[17] In both South Korea and Taiwan, where TM use is common in clinical practice, TM treatments are listed in their NHI schemes. In both countries, TM plays an important role in the National Healthcare System.[13,18–20] Furthermore, South Korea and Taiwan are the only two countries that have released details of the nationwide TM use in their NHI database to researchers. Using such large nationwide databases, researchers can access data with less selection bias than might occur with other study designs.[21] Currently, there are no studies comparing the utilization pattern of TM in treating patients with AR between these two countries. Therefore, in this study, we used large, population-based NHI databases to describe and compare the pattern of TM use in the treatment of adult patients with AR between South Korea with Taiwan.

2. Methods

2.1. Data source

The Taiwan NHI program was started in 1995 and, by the end of 2011, covered nearly all inhabitants. The use of TM has been reimbursed by the NHI since 1996. People in Taiwan are free to choose WM or TM and are allowed to visit either public or private medical facilities. In 1999, the Bureau of NHI began to release all claims data in electronic form to the public under the National Health Insurance Research Database (NHIRD) project. The structure of the claim files is described in detail on the NHIRD website and in other publications.[16,22] In brief, the database ambulatory care expenditures by visits file 2011 (CD 2011) was a collection of all visit files claimed from all medical care institutions containing the date of the visit, the patients' gender, date of birth, specialties and three major diagnoses of the visit coded using the International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM). The dataset details of ambulatory care orders file 2011 (OO 2011) included all corresponding order files in a visit containing medical procedures, the drug prescribed and laboratory tests. Another registry for contracted medical facilities file 2011 (HOSB 2011) included basic data regarding the status of accreditation of medical care institutions: medical center, regional hospital, local hospital, and primary care unit, and beneficiaries' registry ID file to identify the number of valid beneficiaries in the study period. These files were also obtained for data-linking during data analyses.

Taiwan NHI benefits are available for TM that includes Chinese herbal remedies, acupuncture and traumatology manipulative therapy, especially for joint dislocation. In Taiwan, TM is reimbursed by the NHI only for ambulatory visits. At the end of 2011, there were 16 TM hospitals and 3411 TM clinics providing TM ambulatory visits. In addition, only licensed TM physicians qualify for reimbursement from the NHI. Specifically, 337 types of Chinese herbal formulas and over 500 types of Chinese single herbal preparations are covered by the Taiwan NHI.

South Korea started a mandatory social insurance system in 1977 and extended the coverage to the entire nation in 1989. More than 97% of the population is covered by the South Korea NHI, which covers both WM and TM. TM in South Korea, also known as Korean Medicine, shares its origins with Chinese and Japanese medicine but has several unique characteristics and treatment modalities, such as Sasang constitutional medicine, Saam acupuncture and Chuna.[23] TM in Korea includes acupuncture, moxibusion, cupping, pharmacupuncture and herbal medicine. TM services, covered by the Korea NHI since 1987, are restricted to diagnosis, herbal preparation, acupuncture and cupping.[24] Specifically, 58 types of Korean herbal formulas and 68 types of Korean single herbal preparations are covered by the South Korea NHI. Since 2013, South Korea has released the National Sample Cohort data, which contain records of all of the NHI data from the South Korea NHI program. Since 2014, the NHI service has released sampling research databases, including eligibility databases, medical treatment databases, health examination databases and medical care institution databases. Types of medical institutes in South Korea are categorized according to size: a tertiary general hospital is responsible for teaching and training and for the treatment of severe cases; a general hospital is a large hospital over 100 beds. Hospitals such as dental

hospitals, Korean Medicine hospitals and medical care hospitals have 30 or more beds. A Korean medical clinic is a clinic used mainly for outpatients, and a health center is used for community health.

2.2. Study design

We retrieved data of the longitudinal cohort of the NHI Cohort Database of the NHI Service in South Korea and the longitudinal cohort NHI Database from the NHIRD in Taiwan. Each of these datasets included approximately one million randomly sampled inhabitants (South Korea: 1,039,004 inhabitants, Taiwan: 1,022,847 inhabitants) without significant differences in age, sex and income level compared with the population at large. All of the data were de-identified to protect privacy before being released from NHI research institutes of both countries. Our study was approved by the Institutional Review Board (IRB) of Kyung Hee University in South Korea (approval # KHSIRB-15-057(EA)) and the IRB of National Yang-Ming University in Taiwan (YM105098E).

The selection process of the subjects in this study was as follows. In the case of Taiwan, the ICD-9-CM was used to select patients from the cohort database in 2011, the primary diagnosis of which was AR (ICD-9-CM code: 477.0, 477.1, 477.2, 477.8, 477.9). In South Korea, the disease was diagnosed using the Korean Classification of Disease, 6th Edition (KCD-6), which is a modified version of the ICD-10.[25] Patients whose main diagnosis was AR (ICD10 code: J30.1-J30.41) were selected from the NHID_GY20_T1_2011 (medical table) and NHID_GY20_T2_2011 (dental and Korean medical table). AR patients aged over 20 years old were included in this cross-country comparison. Overall, 114,761 South Korean adult patients and 54,555 Taiwanese adult patients with AR were included in this study. We defined WM users as individuals who had visited western medicine health-care institutes more than once during 2011, and TM users as those who had sought TM health-care institutes more than once during the same year. Regarding socio-economic status, we classified a patient's income level into five categories according to their monthly income as following: 1), the low (lowest 20%) income group, 2), the low-middle (lower 20–40%) income group, 3), the middle (40–60%) income group, 4), the middle–high (60–80%) income group and 5), the high (upper 20%) income group.

2.3. Statistical analysis

Descriptive statistics were performed to analyze the patients' demographic characteristics, WM and TM use, use of medical services, and most frequently prescribed powdered herbal preparation. We used the χ^2 test or cross-tabulation to examine the relationship between each variable, the differences between WM users and TM users, and those between the two countries among TM users when appropriate. A p-value < 0.05 two tailed was considered to be statistically significant. All data were analyzed using SAS™ version 9.3 (SAS Institute Inc., NC USA).

3. Results

There were significantly more adult patients with AR using TM in Taiwan (9898/54,555, 18.1%) than in South Korea (533/114,761, 0.5%) during 2011. After excluding patients who visited both WM and TM facilities, there were 70,411 WM users and 533 TM users of AR patients in the South Korea NHI Cohort Database in 2011, and 30, 750 WM users and 9898 TM users of AR patients in the Taiwan NHI Research Database in 2011. Table 1 presents the basic characteristics of WM and TM users with AR in the two countries. There was significant variability between WM and TM users in each group including gender, age, and income level due to the large sample size ($P < 0.001$). TM users from both countries were more prevalent among women and the younger population aged 20–39 years of age. In South Korea, AR patients with a high income level used WM and TM more frequently than those with lower income levels. However, AR patients with low income levels used the highest frequency of WM and TM in Taiwan.

Table 2 shows the utilization pattern of TM in adult patients with AR in both countries. South Korea TM users had more frequent TM visits than the Taiwan TM users. There were 58.2% of South Korea TM users who had TM visits more than 10 times in 2011, while 95% of Taiwan TM users had TM visits less than 10 times in 2011. AR patients used TM more commonly in the fall, spring and winter seasons than in the summer season in South Korea, while Taiwan AR patients used TM more often in the winter, fall and summer season than in the spring season. TM users with AR visited TM clinics significantly more than hospitals in both countries: 99.1% of TM users in South Korea and 81.9% of TM users in Taiwan visited clinics, and only 0.9% of TM users in South Korea and 18.1% of TM users in Taiwan visited hospitals. The most common traditional medicine treatment modality for AR was acupuncture and moxibustion in South Korea, while powdered herbal preparation was the most commonly used modality in Taiwan.

The most commonly used powdered herbal formula/single herb among TM users in South Korea and Taiwan are listed in Table 3 and Table 4, respectively. In South Korea, the most commonly prescribed herbal formulas were *Xiaoqinglong-tang (Socheongryongtong-tang)*, followed by *Jingjielianqiao-tang (Hyeonggaeyeongyo-tang)* and *Buzhongyiqi-tang (Bojungikgi-tang)*. In Taiwan, *Xinyi-san(Sinyi-san), Xiaoqinglong-tang (Socheongryongtong-tang)* and *Xinyiqingfei-tang (Sinyi-chongpei-tang)* were the top three frequently prescribed powdered herbal formulas for treating adult AR patients.

4. Discussion

In this study, we observed that significantly more adult patients with AR used TM in Taiwan (9898/54,555, 18.1%) than in South Korea (533/11,761, 0.5%) during 2011. The ratio of patients with AR who used TM to those who used WM was 1:132 and 1:3.1 in South Korea and Taiwan, respectively. In the case of Taiwan, our results were similar to those of a study reported by Huang in 2015.[3] Several factors may be

Table 1
Demographic characteristics of Western medicine (WM) users and Traditional medicine (TM) users among adult patients with allergic rhinitis in South Korea and Taiwan in 2011.

Country		South Korea					Taiwan				
		WM users		TM users		*p	WM users		TM user		**p
Totel		70,411		533			30,750		9898		
Sex	Male	28,807	40.9%	235	44.1%	<0.001	14,020	45.6%	3978	40.2%	<0.001
	Female	41,604	59.1%	298	55.9%		16,730	54.4%	5920	59.9%	
Age	20–39	28,340	40.2%	265	49.7%	<0.001	13,107	42.7%	5671	57.3%	<0.001
	40–59	28,283	40.2%	205	38.5%		11,678	38.0%	3278	33.1%	
	60–79	12,547	17.8%	60	11.3%		5012	16.3%	879	8.9%	
	≥80	1241	1.8%	3	0.6%		953	3.1%	70	0.7%	
Income level	1	12,064	17.1%	68	12.8%	<0.001	11,920	38.8%	3601	36.4%	<0.001
	2	10,580	15.0%	75	14.1%		6577	21.39	1963	19.8%	
	3	12,420	17.6%	96	18.0%		2690	8.75	937	9.5%	
	4	15,582	22.1%	116	21.8%		5638	18.33	1859	18.8%	
	5	19,765	28.1%	178	33.4%		3925	12.76	1538	15.5%	

*p: The $\chi 2$ test was used to examine the relationship between WM users and TM users in South Korea.
**p: The $\chi 2$ test was used to examine the relationship between WM users and TM users in Taiwan. Income level: see text for details of classification.

Table 2
The utilization pattern of traditional medicine treatment modalities for allergic rhinitis patients in South Korea and Taiwan.

Country		South Korea		Taiwan		
Number of visits/subject	1–3	1084	17.4%	7343	74.2%	$p < 0.001$
	4–6	750	12.1%	1374	13.9%	
	7–10	699	11.3%	690	7.0%	
	11–20	1784	28.7%	413	4.2%	
	>20	1898	30.5%	78	0.8%	
Season (visits)	Spring (Mar.–May.)	1537	24.7%	7803	14.8%	$p < 0.001$
	Summer (Jun.–Aug.)	1223	19.7%	7661	24.3%	
	Fall (Sep.–Nov.)	1973	31.8%	7854	24.9%	
	Winter (Dec.–Feb.)	1482	23.9%	8196	26.0%	
Visit place (visits)	Hospital	55	0.9%	5717	18.1%	$p < 0.001$
	Clinic	6159	99.1%	25,797	81.9%	
Treatment type (visits)	Acupuncture	9605	64.8%	999	2.9%	$p < 0.001$
	Powdered herbal preparation	794	5.4%	33,130	96.5%	
	Electric Acupuncture	331	2.2%	42	0.1%	
	Manipulative Therapy	NA	NA	149	0.4%	
	Cupping	839	5.7%	NA	NA	
	Moxibustion	2994	20.2%	*NA	*NA	
	Hot/Cold Pack	265	1.8%	NA	NA	

NA: Non-existent item in database.
*NA: Moxibustion was counted together with Acupuncture in Taiwan.
p: The $\chi 2$ test was used to examine the utilization pattern between traditional medicine users between South Korea and Taiwan.

contributing to such a large difference in TM use between South Korea and Taiwan. First, in South Korea, the total usage ratio of TM to WM for all illnesses based on the number of NHI claims was 1:6.4, as recorded in the South Korean annual statistics.[26] In Taiwan, the ratio based on NHI claims data was 1:8.[27] Second, the difference between the two countries may be because the majority of reasons that people in South Korea sought TM was for treatment of neurological or musculo-orthopedic disorders.[28] In contrast, according to a 2007 study by Chen et al., Taiwanese people most often seek TM therapy for diseases of the upper respiratory system including AR.[22]

The distribution of utilization patterns in terms of gender and age were similar between WM and TM for AR patients in both South Korea and Taiwan. However, our results were in contrast to the data reported from the Korean Health Panel from 2008 to 2009, which showed the frequency of TM visits in Korea increased with age.[28] In addition, the distribution in terms of income level in South Korea was different than in Taiwan. In South Korea, the high income group had a higher frequency of TM use to treat AR, and the frequency of use decreased when the income levels were lower. Our results were consistent with a previous study[29] and official data from South Korea.[30] In Taiwan, individuals with a low income level tend to seek TM more often than individuals with higher income levels. Our results differed from those in a previous study from Taiwan by Liao.[31] These differences deserve further detailed evaluation.

In the present study, the main TM treatment for AR in South Korea was acupuncture, followed by moxibustion. Conversely, powdered herbal preparations were the most commonly used treatment modality in Taiwan. According to a survey of South Korean TM users, both acupuncture and

Table 3
The top 10 most commonly used herbal formulas for treatment patients with allergic rhinitis in South Korea.

Order	Herbal formula (South Korea name)	Herbal formula (Taiwan name)	Prescribe number
1	*Socheongryong-tang*	*Xiaoqinglong-tang*	267
2	*Hyongeyonggyo-tang*	*Jingjielianqiao-tang*	152
3	*Bojungikgi-tang*	*Buzhongyiqi-tang*	75
4	*Galgeun-tang*	*Gegen-tang*	68
5	*Samsoeum*	*Shensuyin*	50
6	*Yonggyopaedok-tang*	*Liangqiaobaidusan*	21
7	*Galgeunhaegi-tang*	*Gegenjieji-tang*	19
8	*Gumiganghwal-tang*	*Jiuweiqianghuo-tang*	12
9	*Sosiho-tang*	*Xiaochaihu-tang*	12
10	*Insampaedok-san*	*Renshenbaidu-san*	9

Table 4
Top 10 most commonly prescribed herbal formulas for treating patients with allergic rhinitis in Taiwan.

Order	Herbal formula (Taiwan name)	Herbal formula (South Korea name)	Prescribed number
1	*Xinyi-san*	*Sinyi-san*	6108
2	*Xiaoqinglong-tang*	*Socheongryong-tang*	6002
3	*Xinyiqingfei-tang*	*Sinyichongpei-tang*	5578
4	*Canger-san*	*Chongyi-san*	4250
5	*Gegen-tang*	*Galgeun-tang*	2949
6	*Buzhongyiqi-tang*	*Bojungikgi-tang*	2157
7	*Geizhi-tang*	*Gyeji-tang*	1654
8	*Liaweixiaoyao-san*	*Gamisoyo-san*	1567
9	*Chuanqiongchatiao-san*	*ChunGoongdazo-san*	1518
10	*Mahuangfuzixixin-tang*	*Mahwangbujasesin-tang*	1366

powdered herbal preparations are thought by the general population to be highly effective treatments for common diseases.[30] However, in the present study, powdered herbal preparations were used much less often in South Korea than in Taiwan. This difference may be observed because 337 types of Chinese herbal formulas and over 500 types of Chinese single herbal preparations are covered by the Taiwan NHI, while only 58 types of Korean herbal formulas and 68 types of Korean single herbal preparation are covered by the South Korea NHI. Most TM practitioners in South Korea believe that the number of herbs covered by the NHI scheme is too limited for them to formulate an effective prescription.[32] For example, *Xinyisan (Sinyi-san), Xinyiqingfei-tang (Sinyicheongpye-tang) and Buzhongyiqi-tang (Bojungikgi-tang),* which are commonly used to treat AR, are not covered by the South Korea NHI. The efficacy of powdered herbal preparations insured by the NHI is another issue of concern in South Korea. In Taiwan, as well as in other countries where powdered herbal preparations are used, diluting agents are added after the formula is decocted. In contrast, the insured herbal formula in South Korea is composed of several single herb preparations, each of which contains a diluting agent.[32]

Certain of the frequently used herbal formulas in this study have already been shown to be effective in treating patients with AR.[17] For instance, *Xinyiqingfei-tang (Sinyicheongpye-tang)and Xinyisan (Sinyi-san)* can relieve the uncomfortable nasal symptoms of AR patients.[10,33] Additionally, several studies have shown that *buzhongyiqi-tang* and *yupingfeng-san* can alleviate the symptoms of Qi-deficiency in AR patients.[10,34] The commonly used herbal formulas for treating adult AR patients found in this study, such as *Xiaoqinglong-tang (Socheongryong-tang)*, *Xinyiqingfei-tang (Sinyichongpei-tang)*, *Buzhongyiqi-tang (Bojungikgi-tang)* and *Gegen-tang (Galgeun-tang)* are also mentioned in the Kampo Clinical Practice Guidelines in Japan.[35] The present study uncovered several other powdered herbal preparations that are commonly used in clinical practice, but are still not reported in the literature and deserve further research.

To the best of our knowledge, this study is the first to use two nationwide health insurance databases to compare the TM use in adult AR patients between South Korea and Taiwan. This study has several limitations. First, the common TM treatment types, crude herbal drugs, are not covered within the scope of the NHI scheme in either South Korea or Taiwan. Thus, the discussion of herbal prescriptions in this study can only be with reference to powdered herbal preparations. Second, we only included adult AR patients in this study. This is because TM treatment is quite different for adults and children with AR.[15,17] Additionally, the NHI longitudinal cohort used 2002 and 2000 insured beneficiaries as a sampling baseline in South Korea and Taiwan, respectively, and there were yearly dynamic changes of child beneficiaries in these cohorts. Furthermore, in order to keep high consistency between the two databases in different countries, we only used the 2011 data for the comparison in this study. For these reasons, the results are presented based on a limited resource.

In conclusion, based on an analysis of the NHI databases, there were different utilization patterns of TM in adult patients with AR between South Korea and Taiwan. The most common TM treatment modality for AR was acupuncture in South Korea, while powdered herbal preparations were most commonly used in Taiwan. *Xinyi-san (Sinyi-san)* was the most commonly prescribed herbal preparation in Taiwan, while *Xiaoqinglong-tang (Socheongryongtong-tang)* was the most commonly used in South Korea.

Acknowledgments

This research was supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute, funded by the Ministry of Health & Welfare, Republic of Korea (grant number: HI12C1889), and also by a grant from Kyung Hee University in 2014 (KHU-20140692). This study used NHIS-NSC data (NHIS-2016-2-003) made by National Health Insurance Service (NHIS) of South Korea. The authors declare no conflict of interest with NHIS. This study is also based in part on data from the NHIRD provided by the NHI Administration, Ministry of Health and Welfare, Executive Yuan, Taiwan and managed by the National Health Research Institutes, Taiwan. The interpretation and conclusions contained herein do not represent those of NHI Administration, Ministry of Health and Welfare or National Health Research Institutes in Taiwan.

References

1. Van Cauwenberge P, Bachert C, Passalacqua G, Bousquet J, Canonica GW, Howarth PH, et al. Consensus statement on the treatment of allergic rhinitis. European academy of allergology and clinical immunology. *Allergy* 2000;**55**:116−34.
2. Greiner AN, Hellings PW, Rotiroti G, Scadding GK. Allergic rhinitis. *Lancet* 2011;**378**:2112−22.
3. Xue CC, Hugel HM, Li CG, Story DF. Efficacy, chemistry and pharmacology of Chinese herbal medicine for allergic rhinitis. *Curr Med Chem* 2004;**11**:1403−21.
4. Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokken WJ, Togias A, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen). *Allergy* 2008;**63**(Suppl. 86):8−160.
5. Letrán A, Espinazo M, Moreno F. Measurement of IgE to pollen allergen components is helpful in selecting patients for immunotherapy. *Ann Allergy Asthma Immunol* 2013;**111**:295−7.
6. Huang SK, Ho YL, Chang YS. Prescriptions of traditional Chinese medicine, western medicine, and integrated Chinese-Western medicine for allergic rhinitis under the National Health Insurance in Taiwan. *J Ethnopharmacol* 2015;**173**:212−6.
7. Storms W, Meltzer EO, Nathan RA, Seiner JC. Allergic rhinitis: the patient's perspective. *J Allergy Clin Immunol* 1997;**99**:S825−8.
8. Passalacqua G, Compalati E, Schiappoli M, Senna G. Complementary and alternative medicine for the treatment and diagnosis of asthma and allergic diseases. *Monaldi Arch Chest Dis* 2005;**63**:47−54.
9. Xue CC, Li CG, Hügel HM, Story DF. Does acupuncture or Chinese herbal medicine have a role in the treatment of allergic rhinitis? *Curr Opin Allergy Clin Immunol* 2006;**6**:175−9.
10. Guo H, Liu M. Mechanism of traditional Chinese medicine in the treatment of allergic rhinitis. *Chin Med J* 2013;**126**:756−60.
11. Canonica GW, Bousquet J, Mullol J, Scadding GK, Virchow JC. A survey of the burden of allergic rhinitis in Europe. *Allergy* 2007;**62**(Suppl. 85): 17−25.
12. Lai JN, Wu CT, Wang JD. Prescription pattern of Chinese herbal products for breast cancer in taiwan: a population-based study. *Evid Based Complement Alternat Med* 2012;**2012**:891893.
13. Park HL, Lee HS, Shin BC, Liu JP, Shang Q, Yamashita H, et al. Traditional medicine in China, Korea, and Japan: a brief introduction and comparison. *Evid Based Complement Alternat Med* 2012;**2012**:429103.
14. Feng S, Han M, Fan Y, Yang G, Liao Z, Liao W, et al. Acupuncture for the treatment of allergic rhinitis: a systematic review and meta-analysis. *Am J Rhinol Allergy* 2015;**29**:57−62.
15. Wang S, Tang Q, Qian W, Fan Y. Meta-analysis of clinical trials on traditional Chinese herbal medicine for treatment of persistent allergic rhinitis. *Allergy* 2012;**67**:583−92.
16. Kung YY, Chen YC, Hwang SJ, Chen TJ, Chen FP. The prescriptions frequencies and patterns of Chinese herbal medicine for allergic rhinitis in Taiwan. *Allergy* 2006;**61**:1316−8.
17. Yen HR, Liang KL, Huang TP, Fan JY, Chang TT, Sun MF. Characteristics of traditional Chinese medicine use for children with allergic rhinitis: a nationwide population-based study. *Int J Pediatr Otorhinolaryngol* 2015; **79**:591−7.
18. Becker C. Time to pay for quality. CMS will partner with premier in trial project to give financial bonuses to hospitals that deliver the best care. *Mod Healthc* 2003;**33**:6−7.
19. Lim B, Park J, Han C. Attempts to utilize and integrate traditional medicine in North Korea. *J Altern Complement Med* 2009;**15**:217−23.
20. Na S. East asian medicine in South Korea. *Harvard Asia Quart* 2012;**14**:4.
21. Hsing AW, Ioannidis JP. Nationwide population science: lessons from the taiwan national health insurance research database. *JAMA Intern Med* 2015;**175**:1527−9.
22. Chen FP, Chen TJ, Kung YY, Chen YC, Chou LF, Chen FJ, et al. Use frequency of traditional Chinese medicine in Taiwan. *BMC Health Serv Res* 2007;**7**:26.
23. Yin CS, Ko SG. Introduction to the history and current status of evidence-based Korean medicine: a unique integrated system of allopathic and holistic medicine. *Evid Based Complement Alternat Med* 2014;**2014**: 740515.
24. Kwon S. Thirty years of national health insurance in South Korea: lessons for achieving universal health care coverage. *Health Policy Plan* 2009;**24**: 63−71.
25. Lee JH, Lee JS, Park JY, Choi JK, Kim DM, Kim YT, et al. Association of Lifestyle-Related Comorbidities With Periodontitis: A Nationwide Cohort Study in Korea. *Med (Baltimore)* 2015;**94**:e1567.
26. Ministry of Health and Welfare Year Book 2011. *Ministry of health and Welfare* 2011.
27. *Health and National health insurance annual statistics information services*. 2011. http://www.nhi.gov.tw/webdata/webdata.aspx?menu=17&menu_id=1023&webdata_id=3351.
28. Choi JH, Kang S, You CH, Kwon YD. The determinants of choosing traditional Korean medicine or conventional medicine: findings from the Korea health Panel. *Evid Based Complement Alternat Med* 2015;**2015**: 147408.
29. Ock SM, Choi JY, Cha YS, Lee J, Chun MS, Huh CH, et al. The use of complementary and alternative medicine in a general population in South Korea: results from a national survey in 2006. *J Korean Med Sci* 2009;**24**:1−6.
30. *Survey on the current state of Korean medicine utilization*. 2011. http://www.prism.go.kr/homepage/researchCommon/retrieveResearchDetailPopup.do?research_id=1351000-201100127.
31. Liao HL, Ma TC, Chiu YL, Chen JT, Chang YS. Factors influencing the purchasing behavior of TCM outpatients in Taiwan. *J Altern Complement Med* 2008;**14**:741−8.
32. Lim B. Korean medicine coverage in the National Health Insurance in Korea: present situation and critical issues. *Integr Med Res* 2013;**2**:81−8.
33. Yang SH, Hong CY, Yu CL. Decreased serum IgE level, decreased IFN-gamma and IL-5 but increased IL-10 production, and suppressed cyclo-oxygenase 2 mRNA expression in patients with perennial allergic rhinitis after treatment with a new mixed formula of Chinese herbs. *Int Immunopharmacol* 2001;**1**:1173−82.
34. Yang SH, Yu CL, Yang YH. The immune-modulatory effects of a mixed herbal formula on dendritic cells and CD4+ T lymphocytes in the treatment of dust mite allergy asthma and perennial allergic rhinitis. *J Asthma* 2016;**53**:446−51.
35. Motoo Y, Arai I, Hyodo I, Tsutani K. Current status of Kampo (Japanese herbal) medicines in Japanese clinical practice guidelines. *Complement Ther Med* 2009;**17**:147−54.