

## Original Article

# Associations of Herbs and Nonvitamin Dietary Supplements Use with Clinical Outcomes among Adult and Pediatric Patients with Asthma in the United States

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**What is already known about this topic?** As one kind of complementary and alternative medicine, herbs and nonvitamin dietary supplements (NVDS) have been broadly used among patients with asthma.

**What does this article add to our knowledge?** Herbs and NVDS use was not associated with a patient's likelihood of having an asthma episode, but potential benefit of these supplemental medications use on asthma-related emergency department visits might exist for adult patients with asthma.

**How does this study impact current management guidelines?** Based on this study, herbs and NVDS use among patients with asthma needs to be considered and further evaluated.

**BACKGROUND:** Herbs and nonvitamin dietary supplements (NVDS) have been commonly used among patients with asthma, yet evidence of their impact on patients' clinical outcomes is limited.

**OBJECTIVE:** This study examined the associations of herbs and NVDS use with asthma episodes and asthma-related emergency department (ED) visits among US adults and pediatric patients with asthma.

**METHODS:** A cross-sectional analysis of the 2012 National Health Interview Survey data included 2,930 US adults and 1923 children with self-reported asthma. We estimated the prevalence and type of herbs and/or NVDS use and identified factors associated with their use. We then used multivariable logistic regression models to examine the associations between these supplemental medications use and asthma outcomes, controlling for patient-related covariates. All results were weighted to represent national estimates.

**RESULTS:** Approximately 7.20% of American children and 21.17% of adults with asthma used herbs and/or NVDS in 2012. Herb and/or NVDS users were more likely to be female, non-Hispanic white, living in the West region, having higher family

income, and having comorbidities compared with nonusers. Herbs and/or NVDS use was associated with lower likelihood of having asthma-related ED visit (adjusted odds ratio = 0.48; 95% confidence interval: 0.31, 0.75) among adult patients with asthma, but not for pediatric patients with asthma. No association between herbs and/or NVDS use and having an asthma episode was observed in either adults or children.

**CONCLUSIONS:** This study found high prevalence of herbs and/or NVDS use among US patients with asthma. Potential benefit of these supplemental medications use on asthma-related ED visits might exist for adult patients with asthma. © 2017 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2017;■:■-■)

**Key words:** Asthma; Asthma episodes; Clinical outcomes; Dietary supplements; Emergency department visits; Herb

Asthma is one of the most common allergic diseases in the world.<sup>1,2</sup> It is a chronic lung disease with characteristics that are variable and recurrent and include reversible airflow obstruction and bronchospasm.<sup>1,2</sup> Asthma can cause recurring periods of coughing, wheezing, tachypnea, dyspnea, hypoxemia, and mucus plugging.<sup>1,2</sup> It not only affects the function of the body but also reduces patients' quality of life.<sup>3-6</sup> During the years 2001-2010, an estimated 25.7 million Americans, including 18.7 million adults and 7.0 million children, had been diagnosed with asthma.<sup>7</sup>

As a chronic disease,<sup>1,2</sup> asthma treatment typically involves symptom management and control by using a variety of medications such as  $\beta$ -agonists, corticosteroids, and leukotriene modifiers.<sup>2,8,9</sup> In addition, an increasing number of Americans pursue complementary and alternative medicine (CAM) to improve quality of life.<sup>10-12</sup> Research has indicated that 40% of adult<sup>13</sup> and 27% of pediatric patients<sup>14</sup> with asthma in United States may use CAM. There are a variety of CAM that have been used for asthma management, such as herbs, dietary

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**Abbreviations used**

ALT- Adult Alternative Medicine file  
 AOR- Adjusted odds ratio  
 CAL- Child Alternative Medicine file  
 CAM- Complementary and alternative medicine  
 CI- Confidence intervals  
 ED- Emergency department  
 NCHS- National Center for Health Statistics  
 NHIS- National Health Interview Survey  
 NVDS- Nonvitamin dietary supplements

supplements, homeopathy, chiropractic, acupuncture, hypnosis, relaxation techniques, and Chinese, Japanese, and Indian medicines.<sup>15</sup> There also has been considerable research investigating the motivations of patients with asthma pursuing CAM treatment. In general, patients with asthma seek CAM treatments for health promotion and disease prevention.<sup>16</sup> As the most commonly used CAM,<sup>17,18</sup> herbs and/or nonvitamin dietary supplements (NVDS) have higher prevalence (17.7% and 4.9% for adults<sup>19</sup> and children,<sup>20</sup> respectively) and have been indicated to have potential benefits for asthma management.<sup>21-24</sup>

Despite the high prevalence of herbs and/or NVDS use in patients with asthma and the potential beneficial effect on asthma management,<sup>17,18,21-24</sup> there have not been any nationally representative studies to assess their impact on clinical outcomes of patients with asthma in real-world settings. Therefore, the main objectives of this study were to estimate the utilization patterns of herbs and/or NVDS use among adult and pediatric patients with asthma in United States, and to examine the associations between herbs and/or NVDS use and asthma-related clinical outcomes.

**METHODS****Study sample**

This was a retrospective cross-sectional study design using the 2012 National Health Interview Survey (NHIS) datasets, which is a large scale of continuing probability survey of households' representative of the civilian noninstitutionalized population in the United States. It is conducted annually by the National Center for Health Statistics, Centers for Disease Control and Prevention. The NHIS administers face-to-face interviews in a nationally representative sample of households. In 2012, more than 100,000 US individuals in 43,345 families responded to the NHIS.

For this study, we used the Adult and Child CAM files, the person file, and imputed income files in the 2012 NHIS datasets. Adult Alternative Medicine file (ALT) and Child Alternative Medicine file (CAL) are 2 NCHS-added supplementary questionnaires. These 2 core surveys collected information on various types of CAM use among respondents. The response rates for ALT and CAL in 2012 were 61.2% and 69.7%, respectively. The Sample Child Core obtains additional information on the health of one randomly selected child (the sample child) in the family. For sample children, information is provided by a knowledgeable adult family member residing in the household. In 2012, the supplement included sample children aged 4-17 years ( $n = 13,275$  children). The Person File contains information on health status and limitation of activity, health care access and utilization, health insurance, sociodemographics, and income and assets. The information of family income data is in the Imputed Income File. A detailed description of the

NHIS sample design and the survey questionnaires for specific years is available from NHIS description documents.<sup>25</sup>

The study population was limited to US adults (aged  $\geq 18$ ) and children (aged 4-17) with concurrent asthma. Both adult and pediatric participants were classified as having current asthma by answering "yes" to both of the following questions: "Has a doctor or other health professional EVER told you that you had asthma?" and "Do you still have asthma?" Individuals who responded "no" to "Do you still have asthma?" were considered as formerly but not currently having asthma and were excluded from the analysis. We also excluded individuals with missing or incomplete data on asthma status ( $n = 20$  adults and  $n = 12$  children). The final study sample size included 2,930 adults (weighted  $n = 19,168,471$ ) and 1,923 children (weighted  $n = 10,353,461$ ). This study was approved by the Auburn University institutional review board.

**Measurements**

Herbs and/or NVDS use was measured as a binary variable from the 2012 ALT and CAL files based on the question: "During the past 12 months, have you taken any herbal medication or other nonvitamin supplements listed on this card for yourself?" The individual herbs and NVDS included in the survey can be found at the NHIS website.<sup>26</sup>

Asthma clinical outcomes were identified as binary variables of having asthma episodes (yes/no) and having asthma-related emergency department (ED) visits (yes/no) among patients with asthma. Two questions from the ATL and CAL files were asked to the respondents to determine whether they had asthma episodes or went to ED because of asthma in the past 12 months. The first question was: "During the past 12 months, have you had an episode of asthma or an asthma attack?" The question pertaining to the ED visit because of asthma was: "During the past 12 months, have you had to visit an ED or urgent care center because of asthma?"

The following covariates were also identified from Sample Adult File, Sample Child File, Person File, and Imputed Income Files: sociodemographic variables included sex (male and female), race/ethnicity (non-Hispanic white, non-Hispanic black, Asian, Hispanic, or others), age (18-44, 45-64,  $\geq 65$  in the adult sample and 4-10, 10-17 in the pediatric sample), region (Northeast, Midwest, West, and South), marital status, annual family income, drinking, smoking, physical activities status, and the status of adult family members using herbs and/or NVDS (only in pediatric sample). Comorbidity variables included the self-reported diagnosis of mental disorder, chronic obstructive pulmonary disease, emphysema, hypertension, bronchitis, influenza/phenomena, sinusitis, acid reflux/heartburn, and allergy conditions in the past 12 months (respiratory allergy, hay fever, food allergy, and eczema).

**Statistical analyses**

First, we estimated the prevalence of herbs and/or NVDS use, overall and by individual type, among adult and pediatric patients with asthma. Then we compared covariates between patients with asthma with and without any herbs and/or NVDS use in both adult and pediatric asthma samples using  $\chi^2$  tests. Proportions of participants with any asthma episodes and asthma-related ED visits were also compared between patients with asthma with and without any herbs and/or NVDS use in both adult and pediatric asthma samples. Proportion estimates were calculated by using NHIS weights, which were calibrated to the US 2010 census totals for sex, age, and race/ethnicity of the 2012 US population.

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