

## ALTERNATIVE/COMPLEMENTARY MEDICINE

**Complementary and alternative medicine use and asthma: relation to asthma severity and comorbid chronic disease**

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**Abstract**

**Objective:** To determine (a) the prevalence of complementary and alternative medicine (CAM) use among people with asthma, and (b) if comorbid chronic disease and asthma severity are associated with CAM use. **Methods:** This cross-sectional study utilized data from  $n = 15\,276$  adults who participated in the 2009 Behavioral Risk Factor Surveillance System (BRFSS) and the 2009 Asthma Callback Survey (ACBS). Binary Logistic regression was used to determine if comorbid disease and asthma severity were associated with CAM use (yes/no). Model covariates were age, sex, income, and education. **Results:** About 26% of respondents report using at least one form of CAM. The most frequently reported form of CAM use is breathing exercises (19.8%). The results indicate that neither comorbid cardiovascular disease, diabetes, nor stroke are related to CAM use, but individuals with more severe asthma symptoms were more likely to use CAM (OR = 1.05, 95% CI 1.04, 1.05). **Conclusions:** CAM remedies most often reported by people with asthma (breathing techniques, vitamins) are unlikely to pose safety risks. Comorbid chronic disease does not motivate people with asthma to seek unconventional remedies. The increase in CAM use with asthma severity prompts questions about factors that might drive this behavior, such as untreated/inadequately treated disease, or medication side effects.

**Keywords**

Asthma Callback Survey, asthma management, BRFSS, population survey, self-management

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**Introduction**

It is estimated that 25 million individuals in the United States suffer from asthma [1]. Asthma is a chronic disease characterized by airway inflammation and constriction, caused by interplay between the immune system and the environment [2]. Asthma episodes may be triggered by environmental factors such as air pollution, tobacco smoke and pets. Asthma often requires ongoing medical management and a variety of medications are available to treat asthma. However, some individuals use complementary and alternative medication (CAM) to treat asthma. CAM treatments may be used exclusively or in combination with prescription and over-the-counter medications. CAM use has also been linked to other chronic diseases [3–5].

CAM is defined as “the array of health care approaches with a history of use or origins outside of mainstream medicine” [6]. It is estimated that 4 out of 10 adults in the United States use CAM [7]. The annual use of CAM in the United States has increased from 33.7% to 42.1% [8], but the exact number of individuals using CAM who suffer from asthma is unclear.

Conventional medications used to treat asthma include inhaled corticosteroids, leukotriene modifiers and long-acting beta antagonists [9]. Individuals seek alternative treatments for asthma to enhance health, prevent disease and to treat existing health problems [10]. Estimates of the percentage of individuals with asthma using CAM vary from 4% to 79% [11]. CAM therapies used for asthma relief vary greatly and include massage therapy, herbal remedies, homeopathy, breathing techniques, acupuncture and vitamins. Two studies report that herbal remedies are among the most popular CAM [4,8] while another study found that chiropractic manipulation was the most popular [10]. Differences in preferences may be due to sample differences.

Some varieties of CAM such as herbal remedies may potentially interact adversely with conventional medications. The likelihood of such adverse interactions is increased because only 34% of individuals using CAM tell their doctors about it [8]. Physicians’ and emergency caregivers’ ability to properly treat chronic or acute asthma is compromised if they are unaware of the patients’ use of CAM. Certain types of CAM are contraindicated for use with conventional medications, and certain types of CAM may also increase the severity of asthma symptoms. Echinacea is a member of the daisy family and worsening asthma may result from allergic reactions to products derived from the daisy family [12]. CAM ingredients and dosages are not regulated or

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standardized as conventional medications and this increases the risk of toxicity [8] and allergic reactions [12].

There is variation in CAM use among subgroups. A study investigating CAM use in children with asthma found that CAM use was most prevalent with poor, African-American children and parents with less than high school education, and children who had persistent symptoms of asthma [13]. Using the 2001 Behavioral Risk Factor Surveillance System (BRFSS) data comparing North Carolina to the national average, females, non-Hispanic whites, people aged 35–54, individuals with less than a high school education, individuals with an income level of \$35 000 or more per year and people with a very good health status were more likely to use CAM [8]. A variety of other studies among specific subpopulations found varying results with respect to who was more likely to use CAM [14,15].

CAM use is associated with other chronic health conditions besides asthma. For example, one study found that over half of the individuals suffering from chronic obstructive pulmonary disease (COPD) used CAM [4]. Similar results have been found with individuals suffering from cancer, arthritis, cardiovascular disease, lung disease [3] and noncancerous pain in the veteran population [5]. Individuals with these chronic conditions were more likely than the general population to use CAM. The severity of disease also affected CAM use. Individuals reported that they were more likely to use CAM if their asthma symptoms were mild and use of traditional asthma medication increased as the symptoms became more severe [15]. People with chronic disease are more likely to use CAM but disease burden, or how many diseases an individual suffers from, was found not to influence CAM use [5].

Although the current literature suggests that chronic disease is associated with CAM use, little research has been done to evaluate CAM use among asthma sufferers who have additional chronic diseases. This study addresses this limitation of current knowledge. The Behavioral Risk Factor Surveillance Survey [16] and Asthma Callback Survey [17] provide information about history of asthma and other chronic diseases, such as heart disease, diabetes and stroke. Some respondents to the BRFSS who reported histories of asthma were then administered the Asthma Callback Survey at a later date, which included extensive questioning about CAM use.

The first goal of this study is to estimate the types and prevalence of CAM use among individuals in the US general population with asthma. The second goal is to determine if an association exists between CAM use and the presence of comorbid chronic diseases (e.g. heart disease, stroke and diabetes). The third goal is to determine if asthma severity is associated with CAM use.

## Methods

### Participants

This study was reviewed and approved by the IRB at Auburn University at Montgomery. The 2009 Asthma Callback Survey [17] was administered to 15 403 participants who had previously participated in the 2009 BRFSS survey. The BRFSS is a random digit dialing telephone survey performed

in all 50 United States and including, Guam, the District of Columbia, the US Virgin Islands and Puerto Rico. Selected participants who reported current asthma were asked to participate in the Asthma Callback Survey approximately 2 weeks after responding to the BRFSS [18]. Every participant who completed the Asthma Callback Survey had earlier participated in the BRFSS survey, and all BRFSS survey responses are included in the Asthma Callback Survey data set. Because of missing values for some variables, the sample size for this study was  $n = 15\,063$ , or 97.8% of the available sample. As data loss was minimal, missing values were not imputed. Four-thousand two-hundred and seventy-three respondents reported using at least one CAM remedy in the preceding 12-month period and 10 790 reported no CAM use.

Table 1 summarizes additional demographic information about the survey respondents. Actual sample frequencies are reported along with corresponding weighted percents because these provide better approximations of population values.

Table 1. Demographic characteristics of 2009 BFRSS Asthma Callback Survey Sample ( $N = 15\,344$  and  $15\,403$ ).

| Variables                                                       | N      | Weighted percent |
|-----------------------------------------------------------------|--------|------------------|
| <b>N = 15 344</b>                                               |        |                  |
| Sex                                                             |        |                  |
| Women                                                           | 10 750 | 59.8             |
| Men                                                             | 4653   | 40.2             |
| Race/ethnicity                                                  |        |                  |
| White                                                           | 12 284 | 70.5             |
| Black                                                           | 888    | 9.2              |
| Other non-hispanic                                              | 525    | 5.2              |
| Multi-racial non-hispanic                                       | 491    | 2.3              |
| Hispanic                                                        | 1090   | 12.2             |
| Unknown                                                         | 121    | 0.6              |
| Education                                                       |        |                  |
| Never attended school or K only                                 | 23     | 0.15             |
| Grades 1 through 8                                              | 446    | 2.5              |
| Grades 9 through 11                                             | 920    | 6.6              |
| Grade 12 or GED                                                 | 3964   | 24.4             |
| College 1 year to 3 years<br>(some college or technical school) | 4475   | 29.0             |
| College 4 years or more                                         | 5559   | 37.3             |
| Unknown                                                         | 16     | 0.05             |
| Income                                                          |        |                  |
| Less than \$15 000                                              | 2206   | 12.0             |
| \$15 000–\$25 000                                               | 2532   | 14.5             |
| \$25 000–\$35 000                                               | 1531   | 8.0              |
| \$35 000–\$50 000                                               | 1982   | 12.7             |
| \$50 000 or more                                                | 5582   | 41.6             |
| Unknown                                                         | 1570   | 11.2             |
| Ever diagnosed with heart attack?                               |        |                  |
| No                                                              | 14 084 | 93.8             |
| Yes                                                             | 1204   | 5.6              |
| Unknown                                                         | 115    | 0.7              |
| <b>N = 15 403</b>                                               |        |                  |
| Ever diagnosed with stroke?                                     |        |                  |
| No                                                              | 14 463 | 96.1             |
| Yes                                                             | 886    | 3.7              |
| Unknown                                                         | 54     | 0.2              |
| Ever diagnosed with diabetes?                                   |        |                  |
| No                                                              | 12 509 | 85.6             |
| Yes                                                             | 2476   | 12.3             |
| Pre-diabetes                                                    | 344    | 2.0              |
| Unknown                                                         | 15     | 0.13             |

## Measures

Chronic disease status and asthma severity are the predictor variables in this study and CAM use is the outcome variable. Chronic disease status was measured by participants' responses to survey questions asking about history of cardiovascular disease (yes/no/unknown), stroke (yes/no/unknown) and diabetes (yes/no/pre-diabetes/don't know). Women who reported only gestational diabetes were included in the no diabetes category. CAM use was assessed by asking respondents, "Sometimes people use methods other than prescription medications to help treat or control their asthma. These methods are called non-traditional, complementary, or alternative healthcare. In the past 12 months, have you used \_\_\_\_\_ to control asthma?" CAM use was created as a dichotomous response variable based on whether respondents endorsed any type of CAM use or not.

Asthma severity was measured by the survey question, "During the past 30 days, on how many days did you have any symptoms of asthma?" [17, p. 7]. The response range was 0–30 day(s). As asthma severity is a complex construct that consists of objectively measureable physical limitations, subjective judgment of impairment, and psychological distress, the number of symptomatic days out of the previous 30 was recognized as measuring a part of this construct. Validity of responses to this question as a measure of asthma severity was demonstrated by correlating scores with self-reported general health. The BRFSS general health question asks respondents to rate general health on a scale ranging from 1 = excellent to 5 = poor. The correlation between the asthma severity scale and self-rated general health was statistically significant ( $r_{[14,986]} = 0.29, p < 0.0001$ ), indicating a moderate linear trend for general health to be rated more poorly as number of symptomatic days increases.

Model covariates are sex, age (in years), race, income and education. The rationale for including these covariates in the analysis was to remove any variation in CAM use attributable to these variables, thus allowing the model to better estimate the relationships between CAM use, comorbid chronic disease and asthma severity.

## Design

This is a binary logistic regression model with the outcome variable of self-reported CAM use (yes/no). The variables of interest are self-reported chronic medical conditions (stroke, heart attack and diabetes) and asthma severity.

Data were analyzed using SAS proc surveylogistic. Data analysis was weighted to adjust for the number of telephones in a household, the probability that a telephone number will be selected and how many adults are in the household. The final weighting additionally adjusts for non-response (telephone was not answered in household) and non-coverage (no telephone in household) [19]. This weighting corrects for sampling error and allows a closer approximation of sample estimates to population values. Design effects of the complex survey were taken into account in the data analysis by including the stratification variable for the landline telephone sampling frame and primary sampling unit to account for bias associated with geographic clustering of telephone numbers.

## Results

Callback survey participants ranged in age from 18 to 99 years (mean age = 55.1 years). Table 2 summarizes the number and percent of asthma sufferers who report using various CAM remedies. Breathing techniques were the most commonly reported CAM remedy (19.8%), with vitamins (5.7%) and "other" (5.7%) as next most reported CAM remedies. Percent values in Table 2 are weighted and do not sum to 100 because some respondents report using multiple CAM remedies. About 26% of the survey respondents report using at least one CAM remedy.

The next part of the analysis summarizes the relationships between comorbid chronic disease status, asthma severity and the binary outcome variable CAM use. Model covariates are sex, age (in years), race, income and education. Model fit is significantly better than the null model. The likelihood ratio test was significant ( $\chi^2_{[26]} = 655.442, p < 0.0001$ ). Table 3 summarizes Type III effects for the relationships of all variables included in the model. Asthma severity, cardiovascular disease, diabetes, sex, income and education are significantly related to CAM use. History of stroke, age and race are not associated with CAM use. These variables were removed from the model and the analysis that follows was conducted without these covariates.

Table 4 presents the adjusted odds ratios for the comorbid chronic diseases (except stroke), asthma severity, and all covariates (except age and race). The second hypothesis was that the odds of CAM use would be increased among individuals who reported a history of cardiovascular disease, stroke or diabetes. Type 3 effects were significant for CAM use among individuals reporting cardiovascular disease and

Table 2. Type of CAM use reported by survey participants.

| CAM types            | N     | Weighted percent |
|----------------------|-------|------------------|
| Breathing techniques | 3307  | 19.8             |
| Vitamins             | 967   | 5.7              |
| Herb                 | 585   | 3.7              |
| Aromatherapy         | 474   | 3.2              |
| Yoga                 | 423   | 3.1              |
| Homeopathy           | 237   | 1.6              |
| Acupuncture          | 170   | 1.4              |
| Reflexology          | 184   | 1.2              |
| Acupressure          | 152   | 1                |
| Naturopathy          | 164   | <1               |
| Other                | 998   | 5.7              |
| None                 | 10977 | 73.6             |

Table 3. Type III analysis of effects for variables of interest (chronic diseases, asthma severity) and covariates: relationship to CAM use.

| Variables              | Wald chi-square (df) | p       |
|------------------------|----------------------|---------|
| Cardiovascular disease | 13.3 (2)             | 0.001   |
| Stroke                 | 0.07 (2)             | 0.96    |
| Diabetes               | 11.2 (3)             | 0.01    |
| Asthma severity        | 240.5 (1)            | <0.0001 |
| Sex                    | 38 (1)               | <0.0001 |
| Age                    | 3.3 (1)              | 0.07    |
| Race/ethnicity         | 4.3 (5)              | 0.5     |
| Income                 | 20.7 (5)             | 0.001   |
| Education              | 13.1 (6)             | 0.04    |

Table 4. Adjusted odds ratio estimates of individuals with chronic disease and CAM use.

| Variable                                            | Adjusted odds ratios | 95% confidence interval |
|-----------------------------------------------------|----------------------|-------------------------|
| Heart attack                                        |                      |                         |
| No                                                  | –                    | –                       |
| Yes                                                 | 1                    | 0.8–1.3                 |
| Unknown                                             | 4.6                  | 2–10.6                  |
| Diabetes                                            |                      |                         |
| No                                                  | –                    | –                       |
| Yes                                                 | 0.9                  | 0.7–1                   |
| Borderline                                          | 0.8                  | 0.5–1.2                 |
| Unknown                                             | 6.6                  | 1.8–24.3                |
| Asthma severity                                     | 1.05                 | 1.04–1.05               |
| Sex                                                 |                      |                         |
| Women                                               | –                    | –                       |
| Men                                                 | 0.6                  | 0.5–0.7                 |
| Income                                              |                      |                         |
| \$50 000 or more                                    | –                    | –                       |
| Less than \$15 000                                  | 1.7                  | 1.3–2.2                 |
| \$15 000–\$24 999                                   | 1.5                  | 1.2–1.9                 |
| \$25 000–\$34 999                                   | 1.4                  | 1.1–1.8                 |
| \$35 000–\$49 999                                   | 1.4                  | 1.1–1.8                 |
| Unknown                                             | 1.2                  | 0.9–1.6                 |
| Education                                           |                      |                         |
| College 4 years or more                             | –                    | –                       |
| Never attended school or only attended kindergarten | 0.96                 | 0.2–4.6                 |
| Grades 1 through 8                                  | 0.7                  | 0.4–1.2                 |
| Grades 9 through 11                                 | 0.6                  | 0.4–0.9                 |
| Grade 12 or GED                                     | 0.8                  | 0.6–0.9                 |
| College 1 year to 3 years                           | 0.9                  | 0.7–1.06                |
| Unknown                                             | 0.5                  | 0.06–5.1                |

diabetes. However, inspection of the odds ratios reveals that the only significant effects for both cardiovascular disease and diabetes were the “don’t know” response groups compared to the groups who reported no history of either disease. Respondents with comorbid heart disease or diabetes were no more likely to report CAM use than the comparison group. The hypothesis that individuals with more severe types of asthma would be more likely to use CAM was supported. The odds ratio is 1.05 for asthma severity. For every one unit increase in severity, the odds of CAM use increases 5%. Significant covariates include sex, income and education. Individuals with income less than \$50 000/year were more likely than the comparison group to report CAM use. Men and respondents who completed grades 9–12 or received a GED were less likely to report CAM use than their respective comparison groups.

## Discussion

The goals of this study were to determine the prevalence and type of CAM use among individuals with asthma. In addition, we sought to determine if comorbid chronic disease or asthma symptom severity were associated with CAM use. The results indicate that cardiovascular disease, neither diabetes nor stroke, was related to CAM use among survey respondents with asthma. However, the hypothesis that asthma severity is associated with CAM use was supported. The results indicate that increasing asthma symptom severity is associated with increasing odds of CAM use.

Overall, the results are fairly positive for those concerned about potential hazards of CAM use among adults

with asthma. About 26% of the sample reported using CAM remedies, and by far the most commonly reported remedy is breathing exercises. A 2007 analysis of National Health Interview Survey data found that deep breathing exercises were the second most commonly reported CAM therapy used by survey participants [7]. The NHIS results also indicated that about 40% of adults reported CAM use, which is more than we found among asthma sufferers in the ACBS data. However, the NHIS asks about many more specific CAM practices than the ACBS, and includes as CAM popular dietary plans such as Atkins and South Beach.

Breathing exercises are unlikely to have any significant interactions with known conventional or alternative asthma treatments. Their impact on individuals with asthma likely ranges from beneficial to benign. A randomized controlled trial of Buteyko breathing techniques found that treatment and control groups both experienced comparable degrees of asthma control, improvement in quality of life and improvement in spirometry. However, the Buteyko group reported a larger decrease in the use of inhaled corticosteroids [20].

Aromatherapies, which might logically be potential asthma triggers in some, are not used by many individuals with asthma. Likewise, naturopathic and herbal remedies, which could potentially interact with prescription asthma medications, are not frequently reported. Still, a small percentage of individuals using potentially troublesome remedies among a large number of affected individuals means that unexpected drug interactions are likely to be seen. Risk of complications derives not only from possible conventional medication–CAM interactions, but also from the use of CAM remedies displacing prescribed treatments. Relative to this point, research among African–American samples has found that there is concern about safety and side effects of inhaled corticosteroids [21,22]. Asthma sufferers may reduce ICS use because of these beliefs, and tailor an individual treatment regimen that includes less conventional medication and some CAM treatment, which is viewed as both safe and effective. When parents have positive beliefs about CAM remedies, their application of conventional remedies to their children’s asthma declines, as does asthma control [23]. The practice of specifically inquiring about CAM use among clinic patients with asthma remains an important part of an overall clinical evaluation to avoid foreseeable adverse events.

It is likewise encouraging to find that asthma sufferers with comorbid chronic diseases are no more likely than those without additional disease burden to use CAM remedies. Heart disease, diabetes and stroke often entail disease management strategies that include drug therapies. Adding medications to manage these diseases to an existing asthma medication regimen would yield a more complex overall medication regimen. The potential for this more complex medication regimen to interact with CAM therapies would also increase.

The finding that the odds of CAM use increase with asthma severity raises the possibility that asthma sufferers look to unconventional therapies for relief of suffering if their symptoms are severe enough. Understanding the association between severity and CAM use in greater depth would be beneficial to health care providers. Specifically, it would be useful to determine if these remedies are pursued instead of or

in addition to conventional treatments. There is much to be learned about the use of alternative therapies among those with severe asthma that could have implications for clinical management. At present, we may state that asthma severity may serve as a marker for possible CAM use that clinicians should know about.

This study is limited to the data available from the BRFSS and ACBS. Answering all specific questions about the relationship of asthma severity and CAM use would not be possible using BRFSS and ACBS data, so follow-up research along these lines would entail studies outside of existing survey data. The BRFSS does not provide a complete medical history, and all data are self-report. Other chronic conditions not broadly assessed on the BRFSS (e.g. cancer) could be related to CAM use, but could not be investigated using these data. Additional research is needed to verify if other comorbid chronic diseases are significantly related to CAM use among people with asthma. Because the data are self-report, they are subject to distortions due to recall bias, less than optimal cooperation and any other factors that might bias reporting of personal health history or information.

Another limitation is the selection of CAM remedies asked about in the survey. Some of the therapies are costly and may not be readily available to people in lower income strata. Also, there were no questions on the ACBS about spiritual practices and prayer that are commonly reported when questions about these practices are asked [24]. In the study cited, 43% of the adult respondents reported using prayer for health reasons in the preceding 12 months. In our study, 5.7% reported "other" practices not asked about with specific questions. The difference in these two percentages suggests the possibility that CAM use may have been underreported in this data set, particularly if CAM is more broadly defined to include spiritual practices and prayer.

In summary, this study contributes to the understanding of how adults with asthma utilize CAM remedies. Health care providers should be aware that the use of CAM is significantly associated with asthma severity. Individuals with more severe types of asthma may be receiving aggressive treatments and their increased likelihood of using CAM which could complicate treatment and pose health risks. Not all CAM therapies are harmful, which is certainly the case with breathing exercises, the most frequently reported CAM therapy used by asthma sufferers. Additional research into this area of investigation could focus on whether use of CAM remedies affects psychological endpoints such as sense of physical and psychological well-being, mood and quality of life.

## Conclusions

Key findings of this study are that people with asthma and comorbid diseases such as diabetes, history of heart attack or history of stroke are no more likely to use CAM therapies than asthma sufferers who have none of these chronic diseases. Increasing asthma severity is associated with CAM use. A one-point increase on the asthma severity scale is associated with a 5% increase in the odds of reporting CAM use. CAM use is reported by approximately 26% of the sample, with breathing exercises as the most frequently

reported modality. Although breathing exercises alone are unlikely to pose risks, less frequently used forms of CAM therapies may not be advisable for people with asthma who are using conventional medications.

## Declaration of interest

The authors of this study have no conflicts of interest to declare.

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