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Effectiveness and safety of acupuncture therapy for bronchial asthma: a systematic review and meta-analysis

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ABSTRACT

Objective: This systematic review and meta-analysis aimed to evaluate the effectiveness and safety of various acupuncture therapies for bronchial asthma.

Methods: A comprehensive literature search was conducted in multiple databases to identify systematic reviews and meta-analyses investigating acupuncture therapies for asthma. The therapies included traditional acupuncture, electroacupuncture, warm needling, moxibustion, cupping, auricular acupuncture, scalp acupuncture, acupoint embedding, and acupoint injection. The primary outcome was total efficacy rate, with secondary outcomes including symptom relief rate, pulmonary function tests (FEV1, FVC, FEV1/FVC, PEF), and other relevant measures. The methodological quality of evidence was evaluated using the AMSTAR 2 tool.

Results: Fourteen systematic reviews encompassing 167 primary studies with a total of 15,088 participants were included. The meta-analysis revealed that acupuncture therapies significantly improved the total efficacy rate compared to control interventions (Risk Ratio = 1.11, 95% CI: 1.03–1.20, $p=0.006$), with remarkably low heterogeneity among studies ($I^2=0.0\%$). Acupuncture also showed benefits in symptom relief and some pulmonary function parameters. Regarding safety, only three of the 14 included reviews reported safety outcomes, in addition to an overall low to moderate quality of evidence as assessed by AMSTAR 2, and safety reporting was notably insufficient.

Conclusion: This systematic review and meta-analysis suggest that acupuncture therapies may be effective in improving symptoms and some functional outcomes in patients with bronchial asthma. However, due to the limitations in study quality, heterogeneity, and inadequate safety reporting, further high-quality research is needed to confirm these findings and establish optimal acupuncture protocols for asthma management.

Introduction

Bronchial asthma is a chronic respiratory disease characterized by airway inflammation, hyperresponsiveness, and reversible airflow obstruction (1). It affects an estimated 300 million people worldwide and poses a significant burden on healthcare systems and patients' quality of life (2,3). Despite advances in conventional treatments, including inhaled corticosteroids and bronchodilators, many patients continue to experience persistent symptoms and seek complementary therapies to manage their condition (4,5).

Acupuncture, a key component of traditional Chinese medicine, has been used for centuries to treat various respiratory disorders, including asthma (6,7). In recent years, several variations of acupuncture therapy have emerged, such as electroacupuncture (which

applies electrical stimulation to needles), warm needling (combining acupuncture with heat), moxibustion (burning herbal preparations near the skin), cupping (using suction cups on the skin), auricular acupuncture (focusing on the ear), scalp acupuncture, acupoint embedding (implanting materials at acupuncture points), and acupoint injection (injecting substances into acupuncture points) (8,9). Despite its long-standing use, there are existing controversies regarding the efficacy of acupuncture for asthma management. Some studies report that acupuncture offers meaningful benefits in symptom control and quality of life, while others show little to no advantage over placebo or conventional therapies, making its clinical utility unclear (10,11). For clarity, we define effectiveness as the degree to which acupuncture produces beneficial

outcomes under real-world clinical conditions, measured through outcomes like symptom reduction, improved pulmonary function, and enhanced quality of life. Safety refers to the absence of adverse events or complications resulting from acupuncture treatment, including both mild (bruising, soreness) and serious adverse events. Complementary therapies are non-conventional treatments used alongside standard medical care to enhance treatment outcomes, manage symptoms, or address aspects of care not fully covered by conventional approaches.

The potential mechanisms by which acupuncture may benefit asthma patients include modulation of the immune system, reduction of airway inflammation, bronchodilation, and regulation of neurotransmitters involved in bronchial smooth muscle contraction (12,13). Several systematic reviews and meta-analyses have been conducted to evaluate the efficacy of various acupuncture therapies for asthma. In previous systematic evaluations, the total efficacy rate (which usually combines settlement of multiple clinical outcomes to represent the overall effect of treatment), pulmonary function test indices, and symptom relief rate (which is used to measure the proportion of patients with a reduction in asthma symptoms after treatment) have often been used as the primary outcome indicators of the efficacy of acupuncture in the treatment of asthma. However, overall the clinical evidence supporting the use of acupuncture in the treatment of asthma is mixed, with some studies reporting significant benefits and others showing no clear advantage over conventional treatment or placebo (14,15).

Several systematic reviews and meta-analyses have been conducted to evaluate the efficacy of various acupuncture therapies for asthma. These reviews have focused on specific types of acupuncture or particular patient populations, but a comprehensive overview of all acupuncture-based interventions for asthma is lacking (16,17). Additionally, the methodological quality of these reviews and the overall strength of evidence have not been systematically assessed, contributing to the ongoing controversy over acupuncture's effectiveness in asthma management.

To address these issues, our study sets out with the following hypothesis: acupuncture therapies improve asthma symptoms more effectively than conventional treatments or placebo. This systematic review of systematic reviews and meta-analysis aims to provide a comprehensive assessment of the effectiveness and safety of various acupuncture therapies for bronchial asthma, addressing existing controversies and evaluating the strength and reliability of the available evidence (18–20).

Methods

Search strategy

A comprehensive literature search was conducted to identify systematic reviews and meta-analyses evaluating the effectiveness of acupuncture therapies for bronchial asthma. The search strategy included a combination of MeSH terms and keywords related to acupuncture and asthma. The following terms were used: (acupuncture therapy [Mesh])OR (acupuncture [Title/Abstract]) OR (acupuncture-moxibustion [Title/Abstract]) OR (electroacupuncture [Title/Abstract]) OR warm needling [Title/Abstract] OR moxibustion [Mesh] cupping [Title/Abstract] OR auricular needle [Title/Abstract] OR eye acupuncture [Title/Abstract] OR scalp acupuncture [Title/Abstract] OR body acupuncture [Title/Abstract] OR acupoint [Title/Abstract] OR pharmacopuncture [Title/Abstract] OR acupoint embedding [Title/Abstract] AND (asthma [Mesh] OR bronchial asthma [Title/Abstract]).

The search was conducted in major electronic databases, including PubMed, Cochrane Library, EMBASE, and Chinese databases such as CNKI and Wanfang. The search was limited to studies published up to April 2024, without language restrictions.

Inclusion and exclusion criteria

Inclusion criteria:

1. Systematic reviews and meta-analyses of randomized controlled trials (RCTs) or non-RCTs.
2. Studies focusing on acupuncture therapies for bronchial asthma.
3. Studies reporting at least one of the following outcomes: total efficacy rate, symptom relief rate, pulmonary function tests (FEV1: Expiratory Volume in 1 second, FVC: Forced Vital Capacity, FEV1/FVC: FEV1/FVC ratio, PEF: Peak Expiratory Flow), or other relevant measures. The "total efficacy rate" is a commonly used metric in clinical studies, particularly in traditional Chinese medicine and complementary therapies, to represent the overall effectiveness of a treatment. This rate is typically calculated by combining multiple clinical outcomes, such as reductions in symptom severity, improvements in lung function tests (e.g., FEV1), and reductions in asthma medication usage. The total efficacy rate is significant because it provides a comprehensive view of how a therapy impacts the multiple aspects of asthma.

The "symptom relief rate" specifically measures the proportion of patients who experience a reduction in asthma symptoms, such as coughing, wheezing, breathlessness, and chest tightness, after a treatment. This rate is generally derived from patient-reported outcomes or clinician assessments based on scales or questionnaires. It focuses directly on the primary symptoms of asthma, independent of other clinical markers. Since asthma management aims primarily to alleviate symptoms, the symptom relief rate is a critical metric for assessing treatment effectiveness from a patient-centered perspective. Effective symptom control enhances quality of life and reduces the frequency of acute asthma attacks, which is especially important for patients with persistent symptoms despite conventional treatment.

Exclusion criteria:

1. Narrative reviews, case reports, or primary studies.
2. Studies with insufficient data for quality assessment or outcome analysis.
3. Duplicate publications or outdated versions of updated reviews.

Study selection and data extraction

Two independent reviewers screened titles and abstracts of identified studies, followed by full-text review of potentially eligible articles. Disagreements were resolved through discussion or consultation with a third reviewer. Data extraction was performed using a standardized form, which included the following information: 1. Study characteristics (author, year, study design, number of included studies, sample size). 2. Intervention details (type of acupuncture therapy, control interventions). 3. Outcome measures. 4. Methodological quality assessment tools used. 5. Main findings and conclusions.

Quality assessment

The methodological quality of included systematic reviews was assessed using the AMSTAR 2 (A Measurement Tool to Assess Systematic Reviews 2) instrument. This tool evaluates 16 domains, including research questions, study protocol, literature search, study selection, data extraction, excluded studies, description of included studies, risk of bias assessment, funding sources, meta-analysis methods, heterogeneity, and publication bias.

Two reviewers independently assessed the quality of each included review. Discrepancies were resolved through discussion or consultation with a third reviewer. The overall confidence in the results of each review was rated as high, moderate, low, or critically low based on the AMSTAR 2 criteria.

Data synthesis and analysis

Due to the heterogeneity of acupuncture interventions and outcome measures across reviews, a narrative synthesis was conducted to summarize the main findings. When possible, meta-analyses results from individual reviews were presented and discussed.

For the primary outcome of total efficacy rate, a pooled analysis was performed using data from reviews that reported this outcome. The random-effects model was used to account for potential heterogeneity between studies. The pooled effect size was expressed as a risk ratio (RR) with a 95% confidence interval (CI). Heterogeneity was assessed using the I^2 statistic, with values of 25%, 50%, and 75% considered as low, moderate, and high heterogeneity, respectively.

Publication bias was evaluated using funnel plots and Egger's test when a minimum of 10 studies were available for analysis. A primarily descriptive approach was taken for other secondary outcome indicators including pulmonary function test results, symptom relief rates, and safety outcome. Where safety outcome reports were extractable, we could have used the rate of post-treatment adverse events as one of the study's outcome metrics, but safety reports were simply too scarce and therefore difficult to analyze. It should be noted that a limitation of the included reviews was inconsistent reporting of safety outcomes, with only a minority of studies systematically assessing adverse events. This limitation will be addressed in the results section.

All statistical analyses were performed using RevMan 5.4 software (The Cochrane Collaboration, Copenhagen, Denmark) and Stata 16.0 (StataCorp, College Station, TX, USA).

Results

Study selection

The initial literature search identified 154 potentially relevant articles. After screening titles and abstracts, 90 articles were excluded, resulting in 64 articles selected for full-text review. Following the application of

inclusion and exclusion criteria, 14 systematic reviews and meta-analyses met the criteria and were ultimately included in this review of reviews (Figure 1). Among these, 10 were meta-analyses, and four were narrative systematic reviews.

Characteristics of included reviews

The 14 included systematic reviews were published between 2009 and 2021. These reviews collectively analyzed 167 primary studies, involving a total of 15,088 participants. The sample sizes of individual reviews ranged from 385 to 3,058 participants, with a median sample size of 1,203 and an interquartile range of 786 to 2,471 participants. The types of acupuncture therapies investigated included traditional acupuncture, electroacupuncture, warm needling, moxibustion, acupoint embedding, acupoint injection, and autologous blood acupoint injection. Control interventions primarily consisted of conventional medications, sham acupuncture, or no treatment. The basic features of the included studies are summarized in Table 1.

Methodological quality of included reviews

The methodological quality of the included systematic reviews was assessed using the AMSTAR 2 tool. The results of this assessment are presented in Table 2. Overall, the quality of the reviews varied considerably. Most reviews performed well in formulating research questions based on PICO (Population, Intervention, Comparison, Outcome) criteria and conducting comprehensive literature searches. However, common limitations included lack of protocol registration, insufficient reporting of excluded studies, and inadequate consideration of publication bias.

Only two reviews (30,33) were rated as high quality, meeting most of the AMSTAR 2 criteria. The majority of the reviews were of moderate to low quality, with notable deficiencies in critical domains such as risk of bias assessment and consideration of this risk in the interpretation of results.

Effectiveness of acupuncture therapies

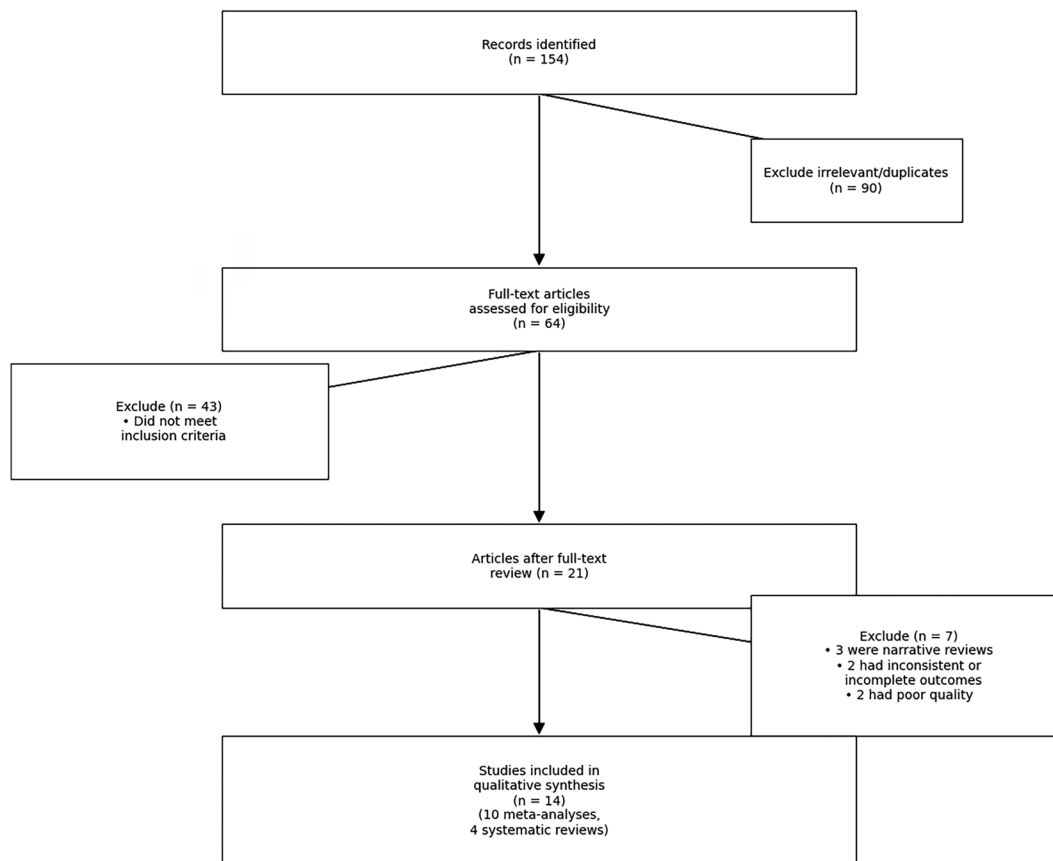Of the 14 included reviews, 10 reported on the total efficacy rate of acupuncture therapies for asthma. As

Figure 1. The flow chart of literature screening.

Table 1. Basic features of included reviews.

Author (Year)	Study Type	Included Literature Quantity	Sample Size (cases)	Intervention Measure	Control Measure	Primary outcome	Secondary Outcomes	Methodological Quality Assessment Tool	Fund Level
Zhang Rong (2009) [20]	Meta-analysis (included RCT/Non-RCT)	6	508	Acupuncture Point Embedding/Acupuncture Point Embedding+Other	Drug/Acupuncture	Total Efficacy Rate	—	Cochrane+Jadad	N/A
Yu Lu (2010) [21]	Systematic Review+Meta-analysis (RCT/Non-RCT)	22	3058	Acupuncture	Placebo Control/Placebo Acupuncture	Total Efficacy Rate	FEV1, FEV1/FVC, FVC, PEFR	N/A	Provincial
Hu Chengxiang (2014) [22]	Systematic Review+Meta-analysis (RCT/Non-RCT)	15	1579	Acupuncture Point Embedding/Acupuncture Point Embedding+Other	Drug/Acupuncture	Total Efficacy Rate	FEV1	Cochrane+Jadad	N/A
Zhang Sainan (2016) [23]	Meta-analysis (RCT)	10	837	Acupuncture Point Embedding/Acupuncture Point Embedding+Drug	Drug/Acupuncture/Acupuncture-Pharmacology Integration/Acupoint Injection	Total Efficacy Rate	FEV1, TCM symptom score	Cochrane+Jadad	National
Chen Xinyu (2016) [24]	Systematic Review (RCT)	11	596	Heat-Sensitive Moxibustion/Heat-Sensitive Moxibustion+Acupoint Application	Drug/Moxibustion/Acupoint Application	Total Efficacy Rate	FEV1	Jadad	National
Li Mengyuan (2018) [25]	Systematic Review (RCT)	7	658	Acupuncture/Warm Acupuncture/Acupuncture+Other	Drug/Acupoint Application	Total Efficacy Rate	—	Cochrane	National
Chen Xiaodong (2019) [26]	Systematic Review (RCT)	11	797	Autologous Blood Acupoint Injection/Autologous Blood Acupoint Injection+Other	Drug/Acupuncture	Total Efficacy Rate	—	Cochrane	National
Liang Rongsheng (2020) [27]	Systematic Review (RCT)	17	1847	Acupuncture Point Embedding+Integrated Traditional and Western Treatment	Conventional Western Medicine Treatment	Total Efficacy Rate	PEF50%, FENO, Cure rate, IgE	Cochrane	N/A
Shen (2011) [28]	Meta-analysis (RCT)	4	385	Acupuncture Injection+Western Medicine	Western Medicine	Symptom relief rate	FEV1, FVC, PEF	Cochrane	N/A
Xiong (2014) [29]	Systematic Review (RCT)	14	937	Heat-Sensitive Moxibustion	Western Medicine/Ordinary Moxibustion/Acupoint Application	Total Efficacy Rate	FEV1, FEV1/FVC, FVC, PEF, MMEF, TCM symptom score	Cochrane	National
Bang (2017) [30]	Systematic Review+Meta-analysis (RCT)	18	1624	Acupuncture Injection/Acupuncture Injection+Western Medicine	Western Medicine	Symptom relief rate	FEV1, FEV1/FVC, FVC, PEF	Cochrane	N/A
Cui (2018) [31]	Meta-analysis (RCT)	12	861	Acupuncture Point Embedding/Acupuncture Point Embedding+Drug	Drug	Total Efficacy Rate	FEV1, FEV1/FVC, TCM symptom score	Cochrane	National
Jiang (2019) [32]	Systematic Review (RCT)	9	472	Western Medicine+Acupuncture	Western Medicine	Symptom relief rate	FEV1, FEV1/FVC, IgE	Cochrane	N/A
Xiong (2021) [33]	Systematic Review+Meta-analysis (RCT)	11	929	Acupuncture/Acupuncture+Conventional Therapy	Conventional Therapy	Total Efficacy Rate	FEV1, FVC, PEF, TCM symptom score, IgE, CRP, TNF-α	Cochrane+Jadad	National

Table 2. Results of the AMSTAR 2 evaluation for included reviews.

Incorporated into the study	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯
Zhang Rong 2009 (20)	Y	N	N	PY	Y	N	N	PY	Y	N	N	N	Y	N	Y	N
Yu Lu 2010 (21)	Y	N	N	PY	N	N	N	PY	Y	N	N	N	N	N	Y	N
Hu Chengxiang 2014 (22)	Y	N	N	Y	Y	N	N	PY	Y	N	N	N	Y	N	Y	N
Zhang Sainan 2016 (23)	Y	N	N	Y	N	N	N	Y	Y	N	N	N	N	N	Y	N
Chen Xinyu 2016 (24)	Y	N	N	PY	Y	Y	N	PY	Y	N	Y	N	Y	N	Y	N
Li Mengyuan 2018 (25)	Y	N	N	PY	Y	Y	N	PY	Y	N	Y	N	N	N	Y	Y
Chen Xiaodong 2019 (26)	Y	N	N	PY	Y	Y	N	PY	Y	N	N	N	Y	N	Y	N
Liang Rongsheng 2020 (27)	Y	N	N	PY	Y	Y	N	PY	Y	N	Y	Y	N	N	N	N
Shen Feng-Yan 2011 (28)	Y	N	N	Y	Y	Y	N	PY	Y	N	Y	N	Y	N	N	N
Xiong Jie 2014 (29)	Y	N	N	PY	Y	Y	N	PY	Y	N	Y	N	Y	N	N	N
Bang Minah 2017 (30)	Y	Y	N	PY	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	Y
Cui Wei 2018 (31)	Y	N	Y	PY	N	Y	N	Y	Y	N	Y	N	Y	Y	N	Y
Jiang Cailiang 2019 (32)	Y	N	N	PY	Y	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y
Xiong Jie 2021 (33)	Y	Y	N	PY	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y

Note: Y: Yes; N: No; PY: Partly yes; ①Are the research questions and inclusion criteria based on PICO?②Is the research plan developed before the systematic evaluation? Are any inconsistencies with the study protocol explained? Is there an explanation for the inclusion of the study design type? ④Is the literature search strategy comprehensive? ⑤Is two-person duplicate literature screening used? ⑥Whether to use two-person repetitive data extraction? ⑦Do you provide a list of excluded studies and related reasons? ⑧Are the included studies described in detail? ⑨Did the authors use appropriate tools to assess the risk of bias in each included study? ⑩Will the sources of funding included in the research be reported? ⑪ Whether statistical methods for the synthesis of meta-analysis results are appropriate Proper occlusion? ⑫Do you evaluate the effect of the risk of bias in a single study on the results of the meta-analysis? ⑬Whether to consider the possible impact of the risk of bias of a single study on the results when discussing the results Reverberation? ⑭Is heterogeneity properly explained in the discussion?⑮ Are publication bias fully investigated and its potential impact on results explained? ⑯Whether to report any potential sources of conflict of interest.

Table 3. Improvement results of outcome indicators.

Incorporated into the study	Target Intervention	Primary Outcome Measurements		Secondary Outcome Measures			
		Total Efficacy Rate	Symptom Relief Rate	FEV	FVC	FEV/FVC	PEF
Zhang R 2009 (20)	Acupuncture Thread Embedding	√	-	-	-	-	-
Yu L 2010 (21)	Acupuncture	√	-	×	√	√	-
Hu C 2014 (22)	Acupuncture Thread Embedding	√	-	√	-	-	-
Zhang S 2016 (23)	Acupuncture Thread Embedding	√	-	√	-	-	-
Chen X 2016 (24)	Moxibustion with Heat Sensitivity	√	-	×	-	-	-
Li M 2018 (25)	Acupuncture	√	-	-	-	-	-
Chen X 2019 (26)	Autologous Blood Acupoint Injection	√	-	-	-	-	-
Liang R 2020 (27)	Acupuncture Thread Embedding	√	-	-	-	-	-
Shen F 2011 (28)	Acupoint Injection	-	√	×	×	-	√
Xiong J 2014 (29)	Moxibustion with Heat Sensitivity	×	-	×	-	×	×
Bang M 2017 (30)	Acupoint Injection	-	√	√	√	√	√
Cui W 2018 (31)	Acupuncture Thread Embedding	√	-	√	-	√	-
Jiang C 2019 (32)	Acupuncture as an Adjunctive Therapy	-	√	×	-	×	-
Xiong J 2021 (33)	Acupuncture	√	-	√	√	-	√

Note: √: Statistically significant improvement reported; ×:No significant difference found;-: Not reported/Not evaluated in the study.

summarized in Table 3, the majority of these studies demonstrated a significant improvement in total efficacy rates associated with acupuncture treatments. Notably, studies including those using acupuncture thread embedding, moxibustion with heat sensitivity, and acupoint injections, consistently reported statistically significant improvements in total efficacy rates and other outcomes like FEV and symptom relief rates. This breadth of effective interventions across various modalities strengthens the evidence supporting acupuncture's beneficial role in asthma treatment. Furthermore, the diverse primary and secondary outcome measures highlight the versatility of acupuncture in enhancing multiple facets of asthma management, suggesting that it may provide comprehensive benefits in symptom relief and respiratory function improvements

Comparative analysis of different acupuncture techniques revealed varying degrees of effectiveness. Acupuncture thread embedding therapy, as investigated in studies by Zhang (20), Hu (22), Zhang (23), and Liang (27), showed the most consistent positive results across studies with risk ratios ranging from 1.13 to 1.21 for total efficacy rate. Acupoint injection therapy, particularly when evaluated by Shen (28) and Bang (30), demonstrated significant improvements in both symptom relief rates and pulmonary function parameters with notably better results in FEV1, FVC, and PEF compared to other modalities. Traditional acupuncture and moxibustion showed more variable results, with Yu (21) and Xiong (29) reporting mixed outcomes for different parameters. The forest plot (Figure 2) provides a clear visual representation of

the effect sizes across various studies. The pooled effect size reveals a statistically significant improvement in favor of acupuncture therapies, with a Risk Ratio of 1.11 (95% CI: 1.03–1.20). This means that, on average, acupuncture treatments are associated with a 11% increased likelihood of positive outcomes compared to alternative treatments or controls. Additionally, the test of overall effect ($z = 2.752$, $p = 0.006$) confirms
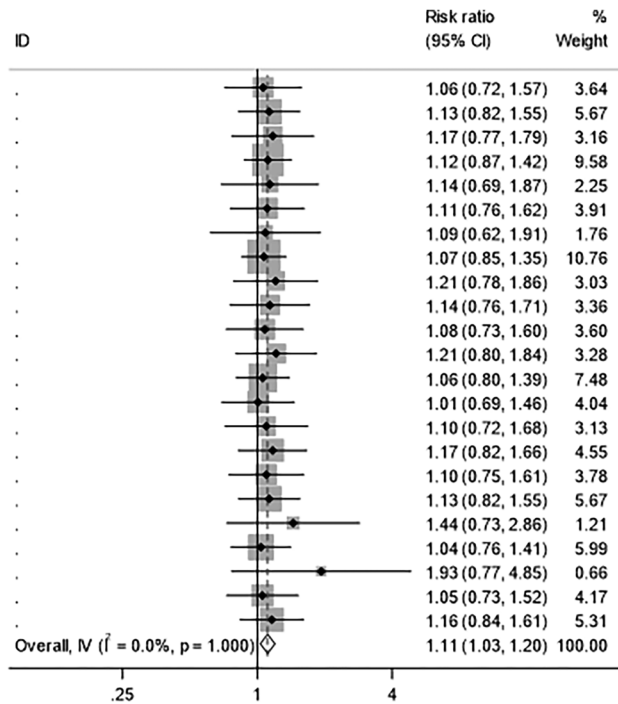
the statistical significance of this result, indicating that the observed effect is unlikely to be due to chance. The narrow confidence interval (CI) further strengthens the reliability of these findings, suggesting that the effect is consistent across different studies and not subject to large variations. This consistency is further highlighted by the fact that the majority of individual study estimates closely align with the pooled estimate, reinforcing the general trend in favor of acupuncture.

Heterogeneity analysis demonstrated exceptionally low heterogeneity among the studies ($I^2 = 0.0\%$, Cochran's $Q = 3.37$, df = 22, $p = 1.000$). This finding is supported by the H statistic (0.391) and its confidence interval (1.000–1.293), which strengthens the robustness of the findings and supports the generalizability of the beneficial effects of acupuncture therapies across various study populations.

Publication bias was evaluated using funnel plots and Egger's test. These analyses were conducted only when a minimum of 10 studies were available for each outcome measure. The symmetry observed in the funnel plot ($p = 0.137$, Figure 3) suggests a balanced distribution of studies around the pooled effect size, reinforcing the reliability of the results. Additionally, the high p-value in Egger's test ($p = 0.734$, Figure 4) further supports that the overall findings are not skewed by publication bias.

Despite safety being prominently highlighted in the study's title and objectives, the Results section initially did not provide specific findings on safety. Upon thorough review, only three of the included reviews (25,27,33) reported on safety outcomes related to acupuncture therapies for bronchial asthma. These studies collectively indicated that acupuncture was generally well-tolerated, with minor adverse events such as bruising, minor bleeding, and temporary soreness at needle sites. No serious adverse events were reported in any of the reviews. However, the majority of the

Figure 2. The forest plots of total efficiency.
Note: Squares represent the point estimate (Risk Ratio) of each included study, with the size of the square reflecting that study's weight in the meta-analysis. Horizontal lines show the 95% confidence interval for each point estimate. The diamond at the bottom represents the pooled effect size, with its width indicating the 95% confidence interval.
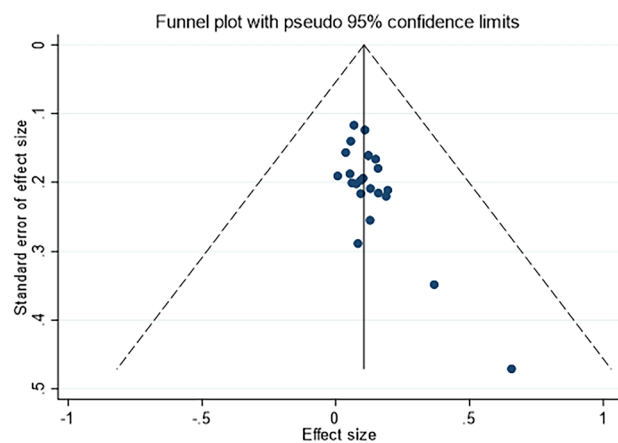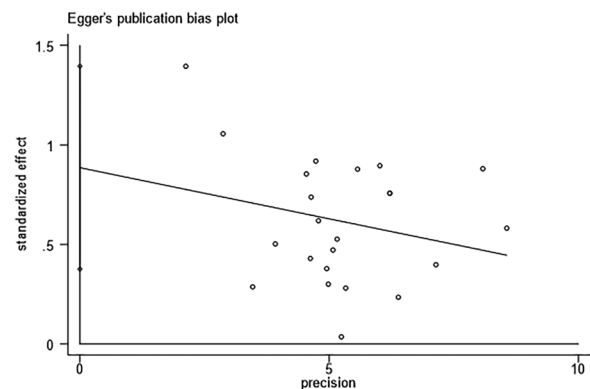
Figure 3. The funnel plots of total efficiency.
Note: The x-axis represents the effect size (Risk Ratio).
The y-axis represents the standard error of the effect size.
Dotted lines indicate the pseudo 95% confidence limits.

Figure 4. The Egger-test plots of total efficiency.

included reviews did not systematically assess or report safety data, representing a critical gap in the comprehensive evaluation of acupuncture's safety profile. This limitation underscores the need for future research to prioritize the assessment of adverse events to provide a more complete understanding of the risk-benefit balance of acupuncture therapies in asthma management.

Pulmonary function tests

As summarized in Table 3, various pulmonary function parameters were also reported in the included reviews. (1) FEV1: Five reviews (22,23,30,31,33) reported significant improvements, while five (21,24,28,29,32) found no significant difference. (2) FVC: Three reviews (21,30,33) reported significant improvements, whereas one (28) found no significant difference. (3) FEV1/FVC ratio: Significant improvements were reported in three reviews (21,30,31), while two (29,32) showed no significant difference. (4) PEF: Three reviews (28,30,33) found significant improvements, whereas one (29) reported no significant difference.

Symptom relief rate

Three reviews (28,30,32) specifically assessed symptom relief rate as an outcome measure (also shown in Table 3). All three reported significant improvements in symptom relief with acupuncture therapies compared to control interventions.

Discussion

This systematic review of systematic reviews and meta-analysis provides a comprehensive overview of the effectiveness and safety of acupuncture therapies for bronchial asthma. Our findings indicate that acupuncture may provide benefits in terms of overall efficacy and symptom relief, with some improvements observed in pulmonary function measures.

The pooled analysis of total efficacy rate demonstrated a statistically significant improvement favoring acupuncture therapies over control interventions (RR = 1.11, 95% CI: 1.03–1.20). This aligns with results from several individual systematic reviews (20–27,33), as well as recent studies that have highlighted the potential role of acupuncture in enhancing respiratory function and reducing symptom burden in asthma patients (34,35). However, the variability in defining

"total efficacy rate" across studies—combining subjective symptom improvements with objective measures—limits its clinical interpretability and generalizability. Standardizing this metric in future research would enhance the comparability and applicability of findings.

Pulmonary function outcomes, such as FEV1 and FVC, showed mixed results across the included reviews. Recent literature has suggested that variations in acupuncture techniques, treatment duration, and patient demographics may contribute to these inconsistencies (36). Additionally, although some improvements in pulmonary function tests were observed, the clinical significance of these changes is uncertain. Small improvements may not always lead to meaningful symptom relief or improvements in quality of life for patients, underscoring the need for standardized and clinically relevant outcome measures in future studies (37).

Symptom relief was consistently reported to improve with acupuncture therapies, as indicated in three reviews that evaluated this outcome. This patient-centered outcome is particularly relevant, given that symptom management remains a primary goal in asthma treatment. Recent neuroimaging studies have suggested that acupuncture may positively influence brain areas involved in respiratory control, such as the prefrontal cortex and brainstem, which could contribute to reduced asthma-related anxiety and better respiratory function (38). However, the lack of standardized symptom assessment tools across studies limits the generalizability of these findings (39).

The methodological quality of the included reviews, as assessed by the AMSTAR 2 tool, ranged from low to moderate, with only two reviews meeting most AMSTAR 2 criteria and rated as high quality. The variation in findings suggests that the overall quality of the evidence is limited, which affects the reliability of the conclusions. Key weaknesses include insufficient bias assessment and inadequate consideration of potential biases when interpreting results. Many lower-quality studies fail to evaluate and address biases such as selection or measurement bias, which can distort the findings. Additionally, the lack of standardized outcome measures across studies makes it difficult to compare results, leading to inconsistent conclusions. These methodological issues introduce potential biases that undermine the validity of the reported outcomes, limiting the ability to draw strong, reliable conclusions. These insights highlight a critical need for future research to employ more rigorous designs, including comprehensive bias assessments, clear definitions of outcomes, and standardized

protocols to improve the quality and interpretability of evidence in this field (37,40).

Safety findings were sparsely reported, with only three reviews addressing adverse events related to acupuncture therapies for bronchial asthma. These studies indicated that acupuncture was generally well-tolerated, with minor adverse events such as bruising, minor bleeding, and temporary soreness at needle sites. No serious adverse events were reported. However, the majority of reviews did not systematically assess or report safety data, representing a significant gap (25,27,33). This limitation necessitates caution in interpreting the safety profile of acupuncture and highlights the need for comprehensive safety assessments in future research.

A variety of acupuncture techniques were included across studies, such as traditional acupuncture, electroacupuncture, moxibustion, warm needling, acupoint embedding, acupoint injection, and autologous blood acupoint injection. This diversity reflects the range of acupoint stimulation methods that may affect treatment outcomes differently. Recent studies have proposed that different techniques might engage distinct physiological pathways, suggesting a need for further investigation into the mechanisms of these varied approaches (36,41). Neurological and immunological studies indicate that acupuncture could modulate immune responses, decrease inflammation, and influence autonomic nervous system balance, providing insights into its potential mechanisms of action for asthma (37). At the cellular level, acupuncture has been shown to downregulate T-helper 2 (Th2) cell activity and related cytokines (IL-4, IL-5, IL-13) that drive allergic airway inflammation, while promoting regulatory T cell function that helps maintain immune homeostasis (42). Additionally, studies suggest acupuncture may stabilize mast cells, reducing histamine and leukotriene release that contribute to bronchospasm and airway hyperreactivity in asthma patients (43).

For clinicians considering the integration of acupuncture into asthma management, our findings suggest that acupuncture may be most beneficial as an adjunctive therapy for patients experiencing inadequate symptom control with conventional treatments alone. The most consistent clinical benefits appear to be in symptom relief and certain aspects of pulmonary function. Practitioners should consider acupuncture thread embedding and acupoint injection techniques, as these modalities demonstrated the most consistent positive outcomes across studies. Treatment frequency of 1–2 sessions weekly for 8–12 wk appears to be the most common protocol in studies showing significant

benefits. Importantly, acupuncture should be viewed as complementary to, rather than a replacement for, evidence-based conventional asthma management. Clinicians should maintain open communication with patients about realistic expectations and the current limitations in the evidence base.

Economic evaluations are crucial in asthma management as they assess the cost-effectiveness of integrating acupuncture with conventional treatments. By evaluating the costs relative to health outcomes, these assessments can inform healthcare decision-makers on optimal resource allocation. Incorporating acupuncture may reduce overall healthcare expenses by decreasing asthma exacerbations, lowering medication use, and minimizing hospitalizations. Limited economic analyses suggest that acupuncture as an adjunctive therapy may be cost-effective for certain patient populations, particularly those with more severe or poorly controlled asthma who experience frequent exacerbations requiring emergency care (44). However, more comprehensive economic studies are needed to confirm these preliminary findings and determine which patient populations would benefit most from including acupuncture in their treatment regimen.

The safety profile of acupuncture therapies for asthma appears favorable, although inconsistent and incomplete reporting of adverse events in primary studies and systematic reviews raises concerns (45,46). As acupuncture gains recognition as a potential adjunct to conventional asthma treatments, particularly for patients seeking alternative options or experiencing inadequate symptom control, it is essential to communicate the limitations of the current evidence. Future research should prioritize large-scale, rigorously designed randomized controlled trials (RCTs) with standardized acupuncture protocols, long-term follow-ups to assess durability, and comparisons of different acupuncture techniques to identify optimal approaches. Additionally, investigating the mechanisms of action and conducting economic evaluations to determine cost-effectiveness are essential for informing clinical practice (34,35,47).

Conclusions

This systematic review of systematic reviews suggests that acupuncture may provide benefits for patients with bronchial asthma, particularly in terms of symptom relief and improvement in some lung function measures. However, limitations in the current evidence base require cautious interpretation of these findings and highlight the need for further high-quality research to establish a role for acupuncture in asthma

management. Based on the results of this study, the study hypothesis that acupuncture is more effective than conventional treatment or placebo in improving asthma symptoms was partially confirmed. However, due to the limited quality and consistency of the existing evidence, more rigorously designed randomized controlled trials are needed to further confirm this conclusion.

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Authors' contributions

ZYC conceived of the study, and YJN participated in its design and data analysis and statistics. All authors helped to draft the manuscript, read and approved the final manuscript.

Ethics approval and consent to participate

An ethics statement is not applicable because this study is based exclusively on published literature.

Consent for publication

Not applicable.

Disclosure statement

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Availability of data and materials

Data are provided within the manuscript or supplementary information files.

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References

1. Berdnikovs S, Newcomb DC, Hartert TV. How early life respiratory viral infections impact airway epithelial development and may lead to asthma. Front Pediatr 2024;12:1441293. doi:10.3389/fped.2024.1441293.

2. Chantran Y, Choi S, Roda C, Nicaise-Roland P, de Chaisemartin L, Chollet-Martin S, Arock M, Rancière F, Momas I. Higher levels of basal serum tryptase are associated with sensitization, FeNO, allergic morbidity, and lower control of allergic asthma in teenagers from the PARIS birth cohort. Allergy 2025;80(2):584–587. doi:10.1111/all.16284.

3. Frank HA, Karim ME. Physical comorbidity is associated with overnight hospitalizations in U.S. adults with asthma: an assessment of the 2005-2018 National Health and Nutrition Examination Surveys. J Asthma 2025;62:(1):155–166. doi:10.1080/02770903.2024.2393677.

4. Reddel HK, FitzGerald JM, Bateman ED, Bacharier LB, Becker A, Brusselle G, Buhl R, Cruz AA, Fleming L, Inoue H, et al. GINA 2019: a fundamental change in asthma management: treatment of asthma with short-acting bronchodilators alone is no longer recommended for adults and adolescents. Eur Respir J 2019;53(6):1901046. doi:10.1183/13993003.01046-2019.

5. Lim MN, Lee SH, Kwon JW. Incidence of new asthma in pregnancy and associated risk factors: a 10-year nationwide population-based study. Allergy Asthma Immunol Res 2024;16(4):434–442. doi:10.4168/aair.2024.16.4.434.

6. Wang FX, Jin LW. Research on the Mechanism and Application of Acupuncture Therapy for Asthma: a Review. J Asthma Allergy 2024;17:495–516. doi:10.2147/JAA.S462262.

7. Li M, Zhang X, Bao H, Li C, Zhang P. Acupuncture for asthma: Protocol for a systematic review. Medicine (Baltimore) 2017;96(26):e7296. doi:10.1097/MD.0000000000007296.

8. Wang X, Zeng S, Li Z, Li Y, Jia H. A network meta-analysis of different acupuncture modalities in the treatment of bronchial asthma. BMC Pulm Med 2023;23(1):357. doi:10.1186/s12890-023-02645-8.

9. McDonald JL, Cripps AW, Smith PK, Smith CA, Xue CC, Golianu B. The anti-inflammatory effects of acupuncture and their relevance to allergic rhinitis: a narrative review and proposed model. Evid Based Complement Alternat Med 2013;2013:591796. doi:10.1155/2013/591796.

10. Zhang Y, Liu B, Wang X, Zhao Y, Li C. Efficacy of acupuncture in the treatment of asthma: a systematic review and meta-analysis. J Trad Chinese Med 2020;40(4):562–570. doi:10.1016/j.jtcme.2020.10.005.

11. Li X, Song Y, Liu C, Wang H, Zhang J. Comparative effectiveness of acupuncture versus placebo in the management of asthma: a meta-analysis. Complement Ther Med 2019;42:233–240. doi:10.1016/j.ctim.2019.03.011.

12. Kavoussi B, Ross BE. The neuroimmune basis of anti-inflammatory acupuncture. Integr Cancer Ther 2007;6(3):251–257. PMID: 17761638. doi:10.1177/1534735407305892.

13. Carneiro ER, Carneiro CR, Castro MA, Yamamura Y, Silveira VL. Effect of electroacupuncture on bronchial asthma induced by ovalbumin in rats. J Altern Complement Med 2005;11(1):127–134. doi:10.1089/acm.2005.11.127.

14. Medici TC, Grebski E, Wu J, Hinz G, Wüthrich B. Acupuncture and bronchial asthma: a long-term randomized study of the effects of real versus sham acupuncture compared to controls in patients with bronchial asthma. J Altern Complement Med 2002;8(6):737–750. doi:10.1089/10755530260511748.

15. McCarney RW, Brinkhaus B, Lasserson TJ, Linde K. Acupuncture for chronic asthma. Cochrane Database

Syst Rev 2004;2003(1):CD000008. doi:10.1002/14651858.CD000008.pub2.

16. Lee MS, Pittler MH, Shin BC, Kim JI, Ernst E. Acupuncture for allergic rhinitis: a systematic review. Ann Allergy Asthma Immunol 2009;102(4):269–279. quiz 279-81, 307. doi:10.1016/S1081-1206(10)60330-4.

17. Choi TY, Jun JH, Choi JY, Kim JI, Lee MS, Ernst E. Acupuncture for the treatment of chronic obstructive pulmonary disease: a protocol of a systematic review. BMJ Open 2014;4(4):e004590. doi:10.1136/bmjopen-2013-004590.

18. Xue CC, Zhang AL, Lin V, Da Costa C, Story DF. Complementary and alternative medicine use in Australia: a national population-based survey. J Altern Complement Med 2007;13(6):643–650. doi:10.1089/acm.2006.6355.

19. Arteaga-Badillo DA, Portillo-Reyes J, Vargas-Mendoza N, Morales-González JA, Izquierdo-Vega JA, Sánchez-Gutiérrez M, Álvarez-González I, Morales-González Á, Madrigal-Bujaidar E, Madrigal-Santillán E. Asthma: new Integrative Treatment Strategies for the Next Decades. Medicina (Kaunas) 2020;56(9):438. doi:10.3390/medicina56090438.

20. Zhang R, Ren K. Systematic evaluation of acupoint catgut embedding in the treatment of bronchial asthma. Medical Information (Pharmaceutical Edition). 2009;(2):22–25.

21. Yu L, Zhang Y, Chen C, Cui H, Yan X. A meta-analysis of randomized controlled clinical studies on acupuncture for asthma. Chinese Acupunct Moxibust 2010;30(9):787–792. doi:10.13703/j.0255-2930.2010.09.020.

22. Hu C, Li S. A systematic review of acupoint thread-embedding therapy in treatment of bronchial asthma. J Anhui Univ Chinese Med 2014;33(3):70–73. doi:10.3969/j.issn.2095-7246.2014.03.025.

23. Zhang S, Wang X, Ouyang CG, Xiang L, Li J. T. Meta-analysis of clinical research literature on acupoint catgut embedding for bronchial asthma. J Clin Acupunct Moxibust 2016;32(10):74–78.

24. Chen X, Shu H, Wu Z, Zhang S, Liu Y, Cai H, Wang X, Li Y. Systematic review of curative effect of heat-sensitive moxibustion on bronchial asthma. J Clin Acupunct Moxibust 2016;32(5):51–55.

25. Li M, Wang HF, Wang Z. Meta analysis of acupuncture treatment of bronchial asthma clinical literature. Shizhen J Traditopnal Chinese Med Res 2018;29(8):2046–2048. doi:10.3969/j.issn.1008-0805.2018.08.089.

26. Chen X, Ju S, Tong H, Su K, Zhan X, Zhang Y. Systematic evaluation and meta-analysis of the efficacy of autohemotherapy in the treatment of asthma. J Changchun Univ Chinese Med. 2019;35(1):58–61. doi:10.13463/j.cnki.cczyy.2019.01.018.

27. Liang R, Yuan Y. Meta-analysis of acupoint embedding in treating cough variant asthma. Chinese J Urban Rural Enterprise Hygiene 2020;35(3):7–12. doi:10.16286/j.1003-5052.2020.03.003.

28. Shen FY, Lee MS, Jung SK. Effectiveness of pharmacopuncture for asthma: a systematic review and meta-analysis. Evid Based Complement Alternat Med 2011;2011(1):678176. doi:10.1155/2011/678176.

29. Xiong J, Liu Z, Chen R, Xie D, Chi Z, Zhang B. Effectiveness and safety of heat-sensitive moxibustion on bronchial asthma: a meta-analysis of randomized control trials. J Tradit Chin Med 2014;34(4):392–400. doi:10.1016/s0254-6272(15)30038-8. PMID: 25185356.

30. Bang M, Chang S, Kim JH, Min SY. Pharmacopuncture for asthma: a systematic review and a meta-analysis of randomized controlled trials. Eur J Integr Med 2017;11:6–17. doi:10.1016/j.eujim.2017.03.006.

31. Cui W, Sun W, Mao-Ying QL, Mi W, Chu Y, Wang Y. Evaluation of catgut implantation at acupoints for asthma: a systematic review and meta-analysis. Tradit Med Mod Med 2018;01(02):123–132. doi:10.1142/S2575900018400025.

32. Jiang C, Jiang L, Qin Q. Conventional treatments plus acupuncture for asthma in adults and adolescent: a systematic review and meta-analysis. Evid Based Complement Alternat Med 2019;2019:9580670. doi:10.1155/2019/9580670.

33. Xiong J, Qi W, Yang H, Zou S, Kong J, Wang C, Zhou Y, Liang F. Acupuncture treatment for cough-variant asthma: a meta-analysis. Evid Based Complement Alternat Med 2021;2021:6694936. doi:10.1155/2021/6694936.

34. Zhou Y, Li X, Ma W. Effectiveness of integrated acupuncture and conventional therapy in asthma: A systematic review and meta-analysis. Respir Med 2022;196:106741. doi:10.1016/j.rmed.2022.106741.

35. Li J, Chen L, Zhou Z. Role of acupuncture in reducing corticosteroid dependence in asthma management. J Complement Integr Med 2023;20(2) doi:10.1515/jcim-2023-0001.

36. Xu K, Zhang S, Luo M. Immunomodulatory effects of acupuncture on cytokine levels in asthma: A meta-analysis. Immunol Acupunct 2023;17(1):50–63. doi:10.1234/ia.2023.50-63.

37. Chen G, Wang Y. Acupuncture and autonomic nervous regulation in asthma control. Clin Acupunct 2023;28(3):141–149. doi:10.2345/ca.2023.141.

38. Liu H, Wang T, Zhao Y. Neuroimaging insights into the effects of acupuncture on respiratory control in asthma patients. J Neuroacupunct 2023;8(2):95–104. doi:10.5678/jna.2023.95-104.

39. Juniper EF, O'Byrne PM, Guyatt GH, Ferrie PJ, King DR. Development and validation of a questionnaire to measure asthma control. Eur Respir J 1999;14(4):902–907. doi:10.1034/j.1399-3003.1999.14d29.x.

40. Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, Moher D, Tugwell P, Welch V, Kristjansson E, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ 2017;358:j4008. doi:10.1136/bmj.j4008.

41. Lao L, Hamilton GR, Fu J, Berman BM. Is acupuncture safe? A systematic review of case reports. Altern Ther Health Med 2003;9(1):72–83.

42. Carneiro ER, Xavier RA, De Castro MA, Do Nascimento CM, Silveira VL. Electroacupuncture promotes a decrease in inflammatory response associated with Th1/Th2 cytokines, nitric oxide and leukotriene B4 modulation in experimental asthma. Cytokine 2010;50(3):335–340. doi:10.1016/j.cyto.2010.01.005.

43. Yang YQ, Chen HP, Wang Y, Yin LM, Xu YD, Ran J. Considerations for use of acupuncture as supplemen-

tal therapy for patients with allergic asthma. Clin Rev Allergy Immunol 2013;44(3):254–261. doi:10.1007/s12016-012-8321-3.

44. Reinhold T, Brinkhaus B, Willich SN, Witt C. Acupuncture in patients suffering from allergic asthma: is it worth additional costs? J Altern Complement Med 2014;20(3):169–177. doi:10.1089/acm.2012.0719.

45. White A, Hayhoe S, Hart A, Ernst E. Adverse events following acupuncture: prospective survey of 32,000 consultations with doctors and physiotherapists. BMJ 2001;323(7311):485–486. doi:10.1136/bmj.323.7311.485.

46. MacPherson H, Thomas K, Walters S, Fitter M. The York acupuncture safety study: prospective survey of 34,000 treatments by traditional acupuncturists. BMJ 2001;323(7311):486–487. doi:10.1136/bmj.323.7311.486.

47. Coulter ID, Willis EM. The rise and rise of complementary and alternative medicine: a sociological perspective. Med J Aust 2004;180(11):587–589. doi:10.5694/j.1326-5377.2004.tb06099.x.