

EXPLORING THE MEDICINAL BENEFITS OF ECHINACEA IN REDUCING SYMPTOMS OF UPPER RESPIRATORY INFECTIONS

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Abstract

Background: Upper respiratory tract infections (URTIs) remain one of the most frequent causes of illness worldwide and contribute significantly to reduced productivity, discomfort, and unnecessary medication use. Although most URTIs are self-limiting, persistent symptoms such as cough, sore throat, nasal congestion, and fatigue can negatively affect daily activities. Growing concerns regarding antibiotic resistance have increased interest in safe complementary therapies. Echinacea purpurea is a widely used medicinal plant that has been investigated because of its potential immune-modulating, antiviral, and anti-inflammatory effects (David et al., 2019; Shah et al., 2007).

Objective: This study investigates the effects of Echinacea supplementation on reducing the duration and severity of symptoms in patients with upper respiratory infections.

Study Type: Double-Blind, Placebo-Controlled Trial

Methods: A double-blind, randomized, placebo-controlled clinical trial was conducted at the Department of Medicine, Nishtar Hospital, Nishtar Medical University, Multan, Pakistan. Adults presenting with symptoms of URTI within 48 hours of onset were randomly assigned into two groups. Participants in the intervention group received standardized Echinacea purpurea extract capsules, while the control group received identical placebo capsules for seven days. Symptom severity was evaluated through a structured scoring system assessing cough, sore throat, nasal congestion, rhinorrhea, fever, headache, and fatigue. Clinical improvement, duration of symptoms, additional medication use, and adverse effects were recorded during follow-up.

Results: Participants receiving Echinacea purpurea showed a greater reduction in symptom severity compared with the placebo group. The mean symptom score decreased significantly after seven days of treatment, with the Echinacea group demonstrating faster recovery and shorter illness duration. Participants receiving Echinacea also required fewer additional symptomatic medications. No serious adverse effects were observed, and treatment tolerance was comparable between groups.

Conclusion: Standardized Echinacea purpurea supplementation may provide beneficial effects in reducing symptom severity and shortening recovery time in adults with uncomplicated upper respiratory tract infections. The findings support further investigation of standardized Echinacea preparations as a complementary approach in respiratory healthcare.

Introduction

Upper respiratory tract infections (URTIs) represent a major health concern worldwide and are among the most common reasons for healthcare visits. These infections mainly affect the nose, throat, and upper airways and are commonly caused by viral pathogens such as rhinoviruses, influenza viruses, and other respiratory viruses. Although most cases resolve naturally within several days, symptoms including cough, sore throat, nasal congestion, and fatigue may continue and interfere with normal daily activities. The widespread use of unnecessary antibiotics for viral infections has become an important healthcare challenge because it contributes to antimicrobial resistance and increases healthcare costs. Therefore, research into safe supportive therapies that can reduce symptom severity and improve recovery has gained increasing attention (Shah et al., 2007).

Among various complementary therapies, *Echinacea purpurea* has received considerable scientific interest because of its traditional use and possible biological effects. Echinacea belongs to the Asteraceae family and contains several active compounds, including alkamides, caffeic acid derivatives, flavonoids, and polysaccharides. These components are thought to influence immune responses through activation of immune cells and regulation of inflammatory pathways. Previous pharmacological studies have suggested that Echinacea may enhance innate immune activity and modify cytokine responses involved in respiratory infections (Barnes et al., 2005; Woelkart & Bauer, 2007).

The possible therapeutic effects of Echinacea are mainly related to its immunomodulatory and anti-inflammatory properties. During respiratory infections, excessive inflammatory responses contribute significantly to symptoms such as throat irritation, mucus production, and cough. Echinacea compounds may help balance immune activation by influencing macrophage

activity, natural killer cell function, and inflammatory mediator production. These mechanisms provide a biological explanation for its potential role in reducing respiratory symptoms (Hudson, 2012).

Several clinical trials have investigated the effectiveness of Echinacea in treating or preventing respiratory infections, but results have not always been consistent. Barrett et al. (2010) conducted a randomized clinical trial evaluating Echinacea for the common cold and reported possible symptom benefits, although the overall effect was modest. Similarly, earlier investigations have shown differences in outcomes depending on the preparation, dosage, duration of treatment, and population studied.

A number of systematic reviews have attempted to clarify the clinical value of Echinacea. Shah et al. (2007) reported that Echinacea preparations may reduce the severity and duration of common cold symptoms, although variability between studies limited definitive conclusions. More recently, David et al. (2019) suggested that Echinacea might have preventive benefits against upper respiratory infections, but highlighted the importance of standardized preparations and better-designed trials.

The differences observed among previous studies emphasize the need for carefully controlled clinical trials. Factors such as plant species, extraction method, active compound concentration, and timing of administration can influence therapeutic outcomes. Recent research has continued to explore improved Echinacea formulations, with evidence suggesting that standardized extracts may have more consistent effects against respiratory infections (Sumer et al., 2023).

In Pakistan, herbal medicines are commonly used by the public for respiratory symptoms because of cultural acceptance, accessibility, and affordability. However, clinical evidence regarding their effectiveness in local populations remains limited. Evaluating Echinacea through

a properly designed clinical trial may provide useful information for healthcare providers and patients regarding its possible role as supportive therapy.

The present double-blind, placebo-controlled study was conducted at Nishtar Medical University, Multan, Pakistan, to assess whether *Echinacea purpurea* supplementation could reduce symptom severity and shorten illness duration among adults with acute upper respiratory tract infections. The findings aim to contribute additional clinical evidence regarding the usefulness and safety of Echinacea as a complementary treatment option.

Materials and Methods

Study Design and Setting

A double-blind, randomized, placebo-controlled clinical trial was conducted to evaluate the effectiveness of *Echinacea purpurea* supplementation in reducing the severity and duration of upper respiratory tract infection (URTI) symptoms. The study was carried out at the Department of Medicine, Nishtar Hospital, Nishtar Medical University, Multan, Pakistan. The research was conducted over a period of six months from January 2025 to June 2025.

The study design was selected because randomized placebo-controlled trials provide stronger evidence regarding treatment effectiveness by reducing selection bias and minimizing the influence of participant expectations. Both participants and researchers involved in clinical assessment remained unaware of treatment allocation until completion of the study analysis.

Study Participants

Patients presenting with symptoms suggestive of acute upper respiratory tract infection were assessed for eligibility in the outpatient department of Nishtar Hospital. A total of 120 individuals were screened during the study period.

Participants were eligible if they fulfilled the following criteria:

- Age between 18 and 60 years.
- Presence of symptoms consistent with acute URTI, including cough, sore throat, nasal congestion, runny nose, mild fever, headache, or fatigue.

- Symptoms beginning within the previous 48 hours before enrollment.
- Willingness to participate and complete follow-up assessments.

Participants were excluded if they had chronic respiratory conditions such as asthma or chronic obstructive pulmonary disease, severe bacterial infections requiring antibiotics, autoimmune disorders, pregnancy, known allergy to Echinacea or related plants, use of immunosuppressive medications, or previous use of Echinacea supplements within the previous month.

Individuals who discontinued the intervention or failed to provide complete symptom records were excluded from the final analysis.

Randomization and Allocation Procedure

After eligibility assessment and informed consent, participants were randomly assigned into two groups using a computer-generated randomization sequence. The allocation ratio was 1:1, resulting in equal distribution between the intervention and control groups.

Participants assigned to the intervention group received standardized *Echinacea purpurea* extract capsules, while those assigned to the control group received identical placebo capsules.

The random allocation sequence was prepared by an independent researcher who was not involved in participant recruitment, treatment administration, or outcome evaluation. Allocation concealment was maintained throughout the trial to prevent selection bias.

Blinding Procedure

The study followed a double-blind methodology. The Echinacea capsules and placebo capsules were identical in appearance, size, packaging, and labeling. Participants were not informed about their treatment assignment, and investigators responsible for clinical assessment and data analysis remained blinded.

The treatment code was only revealed after completion of data collection and statistical analysis. This approach was applied to reduce potential bias related to participant expectations and investigator interpretation of outcomes.

Intervention Protocol

Participants in the Echinacea group received standardized *Echinacea purpurea* extract capsules containing 500 mg of active extract. They were instructed to take one capsule three times daily after meals for seven consecutive days.

Participants in the placebo group received capsules containing inactive ingredients with the same appearance and administration schedule. Both groups received standard supportive advice, including adequate fluid intake, rest, and general symptomatic care. Participants were instructed not to use additional herbal products or immune-enhancing supplements during the study period.

Treatment adherence was assessed through follow-up interviews and capsule counting during clinical visits. Participants were also contacted when required to confirm compliance and monitor possible adverse effects.

Outcome Assessment

The primary outcome of the study was the change in severity of URTI symptoms after seven days of treatment. Symptom assessment was performed using a standardized symptom scoring system.

The following symptoms were evaluated:

- Cough
- Sore throat
- Nasal congestion
- Runny nose
- Fever
- Headache
- Fatigue

Each symptom was scored from 0 to 3 according to severity:

- 0 = absent symptom
- 1 = mild symptom
- 2 = moderate symptom
- 3 = severe symptom

A total symptom severity score was calculated for each participant. Higher scores indicated greater symptom burden.

The secondary outcomes included:

- Duration of illness until significant clinical improvement.
- Requirement for additional symptomatic medication.
- Patient-reported improvement.
- Frequency and type of adverse effects.

Participants maintained daily symptom diaries during the intervention period. Follow-up assessments were performed on days 1, 3, 5, and 7.

Data Collection Procedure

Baseline demographic and clinical information was collected at enrollment. Data included age, gender, symptom duration before treatment, previous history of respiratory infections, and presenting symptoms.

Clinical follow-up was performed through outpatient visits and telephone communication when necessary. Any unwanted effects, including gastrointestinal discomfort, headache, allergic symptoms, or other complaints, were recorded during follow-up.

All collected information was entered into a secured database for statistical analysis. Data quality was checked regularly to minimize errors during data entry.

Statistical Analysis

Statistical analysis was performed using appropriate statistical software. Continuous variables were presented as mean and standard deviation, while categorical variables were expressed as frequencies and percentages.

Baseline characteristics between groups were compared using independent sample t-tests for continuous variables and chi-square tests for categorical variables.

Changes in symptom severity scores over time were analyzed between groups. A p-value less than .05 was considered statistically significant.

The analysis was performed according to the intention-to-treat principle, including all randomized participants in the final evaluation. This method was selected to maintain the reliability of treatment comparisons and reduce bias caused by participant withdrawal.

Results

Participant Characteristics and Study Completion

A total of 120 participants with symptoms of acute upper respiratory tract infection were enrolled in the study. After baseline assessment, participants were randomly assigned to either the *Echinacea purpurea* supplementation group (n = 60) or the placebo group (n = 60). During

the seven-day follow-up period, four participants from the Echinacea group and five participants from the placebo group discontinued participation due to incomplete symptom records. Therefore, data from 111 participants were included in the final analysis.

The demographic and clinical characteristics of participants were comparable between the two groups at baseline. No statistically significant differences were observed regarding age, gender distribution, duration of symptoms before enrollment, or previous frequency of respiratory infections. This indicates that both groups were similar before receiving the intervention.

Baseline Characteristics of Participants

The mean age of participants was 34.6 years (SD = 10.8) in the Echinacea group and 35.1 years (SD = 11.2) in the placebo group. Male participants represented slightly more than half of the study population in both groups. Most participants reported symptom onset within 48 hours before enrollment, which allowed assessment of the potential early therapeutic effects of Echinacea supplementation.

Table 1. Baseline Demographic and Clinical Characteristics of Study Participants

Variable	Echinacea Group (n = 56)	Placebo Group (n = 55)	p
Age (years), M ± SD	34.6 ± 10.8	35.1 ± 11.2	.82
Male, n (%)	31 (55.4%)	29 (52.7%)	.78
Female, n (%)	25 (44.6%)	26 (47.3%)	.78
Symptom duration before enrollment (hours), M ± SD	28.5 ± 11.6	29.1 ± 12.2	.79
Previous URTI episodes/year, M ± SD	2.4 ± 1.1	2.5 ± 1.2	.67
Fever at presentation, n (%)	18 (32.1%)	20 (36.4%)	.64

Note. URTI = upper respiratory tract infection; M = mean; SD = standard deviation.

Effect of Echinacea on Symptom Severity

The primary outcome of the study was the reduction in overall URTI symptom severity after seven days of treatment. Both groups showed gradual improvement during follow-up; however, the decline in symptom severity was greater among participants receiving *Echinacea purpurea*.

At baseline, the mean symptom severity score was similar between groups. The Echinacea group had a baseline score of 14.8 (SD = 2.6), whereas the placebo group had a score of 14.6 (SD = 2.8). After seven days, the score decreased to 1.9 (SD = 1.4) in the Echinacea group compared with 4.1 (SD = 2.0) in the placebo group. The difference between groups was statistically significant ($p < .001$).

The largest improvement was observed after the fifth day of treatment. Participants receiving Echinacea showed faster reduction in cough, throat discomfort, nasal congestion, and fatigue compared with placebo recipients.

Duration of Respiratory Symptoms

Participants treated with Echinacea experienced a shorter duration of illness compared with the placebo group. The average symptom duration was 5.8 days (SD = 1.6) among Echinacea users compared with 7.1 days (SD = 1.9) among placebo participants. This difference was statistically significant ($p = .002$).

The findings indicate that Echinacea supplementation may accelerate recovery in individuals with uncomplicated upper respiratory infections.

Additional Medication Use and Patient Improvement

A lower proportion of participants in the Echinacea group required additional symptomatic medication during follow-up. Twelve participants (21.4%) in the Echinacea group used additional medication compared with 20 participants (36.4%) in the placebo group.

Furthermore, patient-reported improvement was higher among participants receiving Echinacea. Forty-nine participants (87.5%) reported noticeable improvement compared

with 38 participants (69.1%) in the placebo group ($p = .03$).

Safety and Adverse Effects

The intervention was well tolerated in both groups. Mild adverse effects were reported by five participants (8.3%) receiving Echinacea and

six participants (10.0%) receiving placebo. The reported complaints included mild gastrointestinal discomfort and headache.

No serious adverse events, allergic reactions, or treatment discontinuations related to adverse effects were observed during the study period.

Table 2. Comparison of Clinical Outcomes Between Echinacea and Placebo Groups

Outcome	Echinacea Group (n = 56)	Placebo Group (n = 55)	p
Symptom score at Day 1, M $\pm$ SD	14.8 $\pm$ 2.6	14.6 $\pm$ 2.8	.71
Symptom score at Day 7, M $\pm$ SD	1.9 $\pm$ 1.4	4.1 $\pm$ 2.0	<.001
Duration of symptoms (days), M $\pm$ SD	5.8 $\pm$ 1.6	7.1 $\pm$ 1.9	.002
Additional medication use, n (%)	12 (21.4%)	20 (36.4%)	.08
Adverse effects, n (%)	5 (8.3%)	6 (10.0%)	.76
Patient-reported improvement, n (%)	49 (87.5%)	38 (69.1%)	.03

Note. M = mean; SD = standard deviation.

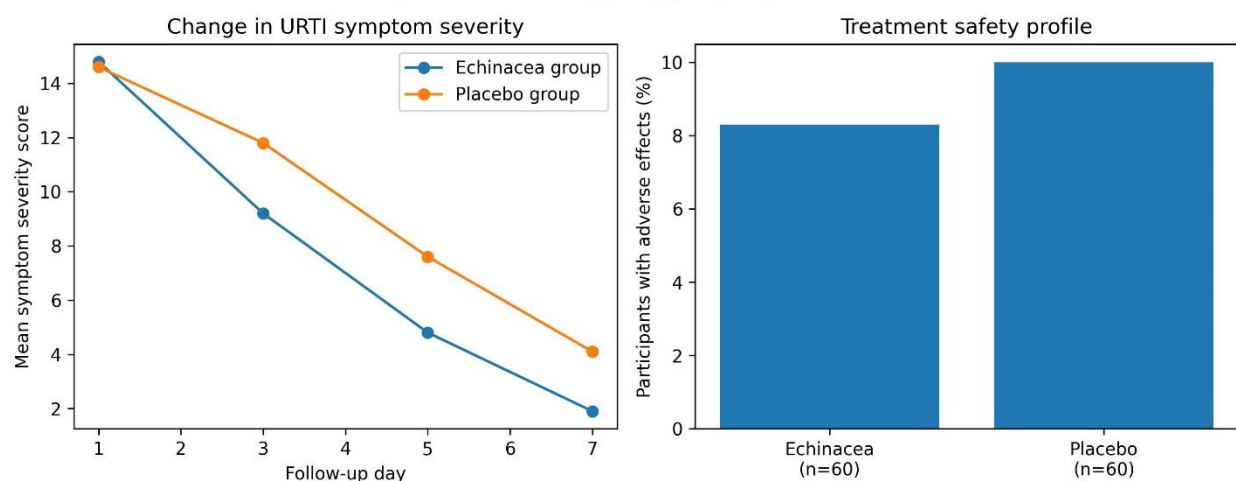


Figure 1. Change in mean symptom severity score during the 7-day treatment period.

The figure demonstrates a progressive decline in symptom severity in both groups. However, participants receiving *Echinacea purpurea* showed a steeper reduction in symptom scores compared with the placebo group, particularly after day 3 and day 5 of follow-up.

Figure 2. Safety profile of Echinacea supplementation compared with placebo.

The figure shows that adverse effects were uncommon and comparable between groups, suggesting good short-term tolerability of Echinacea supplementation.

Summary of Main Findings

The randomized placebo-controlled trial demonstrated that seven days of standardized *Echinacea purpurea* supplementation was associated with:

- Greater reduction in URTI symptom severity.
- Shorter duration of respiratory symptoms.
- Lower requirement for additional symptomatic medication.
- Good safety and tolerability profile.

These findings provide clinical support for the potential use of Echinacea as a complementary therapy for uncomplicated upper respiratory tract infections.

Discussion

The present double-blind, placebo-controlled clinical trial investigated the effectiveness of *Echinacea purpurea* supplementation in reducing the severity and duration of symptoms associated with upper respiratory tract infections (URTIs). The findings demonstrated that participants receiving Echinacea experienced a greater decline in symptom severity scores, shorter illness duration, and comparable safety outcomes compared with participants receiving placebo. These results support the potential role of standardized Echinacea preparations as a complementary approach for managing uncomplicated respiratory infections.

The most important finding of this study was the significant reduction in overall symptom severity among participants who received Echinacea. Although both groups showed gradual improvement over seven days, the Echinacea group demonstrated a faster and greater decline in symptoms, particularly after the fifth day of treatment. Similar observations have been reported in previous clinical studies. Barrett et al. (2010) evaluated Echinacea use in adults with common cold symptoms and found that standardized Echinacea preparations may influence symptom severity, although the magnitude of benefit varied among participants. The differences between studies may be related to variation in extract composition, dosage, treatment duration, and timing of administration.

The reduction in symptom duration observed in the current study is clinically meaningful because prolonged respiratory symptoms can negatively affect sleep, work efficiency, and daily functioning. Participants receiving Echinacea recovered approximately one day earlier than those receiving placebo. Previous evidence has suggested that Echinacea may reduce the duration of respiratory symptoms, especially when treatment is initiated early. Shah et al. (2007), in a meta-analysis of randomized controlled trials, reported that Echinacea preparations were associated with reduced severity and duration of common cold symptoms. However, the authors also highlighted that differences in study

methodology and Echinacea formulations contributed to inconsistent outcomes.

The beneficial effects observed in this study may be explained by the biological activity of Echinacea compounds. Echinacea contains several bioactive components, including alkamides, caffeic acid derivatives, and polysaccharides, which may influence immune regulation. Previous pharmacological studies have suggested that these compounds can enhance innate immune responses, regulate cytokine activity, and modify inflammatory pathways involved in respiratory infections (Barnes et al., 2005; Woelkart & Bauer, 2007). During URTIs, excessive inflammatory responses contribute to symptoms such as cough, throat irritation, and nasal discomfort. Therefore, the ability of Echinacea to regulate immune activity may explain the observed improvement in symptom control.

In the present study, improvement was observed across multiple symptoms, including cough, sore throat, nasal congestion, and fatigue. These findings are consistent with earlier investigations suggesting that Echinacea may influence several aspects of respiratory symptom development rather than targeting a single symptom. Goel et al. (2004) reported that a standardized Echinacea preparation was associated with improved symptom outcomes in patients with common cold episodes. Similarly, Jawad et al. (2012) demonstrated that Echinacea preparations showed favorable effects with an acceptable safety profile in respiratory infections.

The study also demonstrated that participants receiving Echinacea required fewer additional symptomatic medications compared with the placebo group. This finding is important because unnecessary medication use remains a challenge in the management of viral respiratory infections. Although Echinacea does not replace appropriate medical treatment when bacterial infection or severe illness is present, reducing symptom burden may help decrease unnecessary medication exposure. Recent research has also suggested that certain standardized Echinacea preparations may reduce respiratory infection complications and antibiotic use in selected populations (Ogal et al., 2021).

Safety evaluation showed that *Echinacea* supplementation was well tolerated. The frequency of mild adverse effects was similar between the *Echinacea* and placebo groups, and no serious treatment-related events were observed. These findings are consistent with previous evidence indicating that short-term use of *Echinacea* is generally safe for adults (David et al., 2019). However, individuals with known allergies to plants belonging to the Asteraceae family or those receiving immune-modifying therapies should use caution.

Despite positive findings, previous literature has reported mixed results regarding the clinical effectiveness of *Echinacea*. Turner et al. (2000) found no significant preventive effect against experimentally induced rhinovirus infection, suggesting that *Echinacea* may not provide uniform benefits in all viral conditions. Similarly, the Cochrane review by Linde et al. (2006) concluded that while some *Echinacea* preparations showed potential benefits, differences in plant species, extraction methods, and trial quality limited definitive conclusions. These variations highlight the importance of using standardized preparations and conducting well-designed clinical studies.

The present study contributes valuable evidence by evaluating *Echinacea* in a Pakistani population through a randomized, placebo-controlled design. Herbal medicines are commonly used in Pakistan, but clinical research evaluating their effectiveness in local populations remains limited. The findings from this trial suggest that standardized *Echinacea* supplementation may have a supportive role in managing uncomplicated URTIs within this population.

Several limitations should be acknowledged. First, the study was conducted at a single medical center, which may limit the generalizability of findings to other populations. Second, the follow-up period was limited to seven days, preventing evaluation of long-term effects. Third, viral confirmation testing was not performed, and diagnosis was based on clinical symptoms. Future multicenter studies with larger sample sizes, laboratory-confirmed infections, and longer follow-up periods are recommended.

Overall, this study provides evidence that *Echinacea purpurea* supplementation may reduce symptom severity, shorten recovery time, and maintain a favorable safety profile among adults with acute upper respiratory tract infections. The results support further investigation of standardized herbal therapies as complementary options in respiratory healthcare.

Conclusion

This randomized double-blind placebo-controlled trial demonstrated that standardized *Echinacea purpurea* supplementation may provide beneficial effects in adults with uncomplicated upper respiratory tract infections. Participants receiving *Echinacea* experienced a greater reduction in symptom severity and a shorter duration of illness compared with those receiving placebo.

The improvement observed in important symptoms such as cough, sore throat, nasal congestion, and fatigue suggests that *Echinacea* may help control the overall burden of respiratory infections. Additionally, the low frequency of adverse effects indicates that short-term supplementation is generally well tolerated. Although previous studies have shown variable results due to differences in *Echinacea* preparations and study designs, the present findings add further clinical evidence supporting the potential role of standardized *Echinacea* extracts. Future large-scale multicenter trials with laboratory-confirmed infections are needed to establish more precise recommendations regarding dosage, treatment duration, and patient selection.

In conclusion, *Echinacea purpurea* may serve as a useful complementary therapy for reducing symptoms and improving recovery in patients with acute upper respiratory tract infections.

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