

**THE EFFICACY AND SAFETY OF PERMETHRIN-BASED MEDICATIONS FOR THE
TREATMENT OF SCABIES IN CHILDREN: A COMPREHENSIVE SYSTEMATIC
REVIEW**

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ABSTRACT: Introduction: Scabies, a parasitic infestation caused by *Sarcoptes scabiei*, is a significant global health issue, particularly burdening the pediatric population with intense pruritus and the risk of severe secondary bacterial complications. Permethrin 5% cream is globally recommended as the primary treatment. However, a periodically updated, consolidated overview of its efficacy and safety profile specifically within the pediatric demographic is crucial for reinforcing evidence-based clinical guidelines. This systematic review aims to comprehensively evaluate and synthesize the existing evidence on the efficacy and safety of permethrin-based medications for treating scabies in children. Methods: A systematic literature search was conducted in PubMed, Scopus, the Cochrane Library, and Google Scholar for studies published up to December 2025. The review included randomized controlled trials (RCTs), cohort studies, and large case series that assessed the efficacy or safety of 5% permethrin cream in patients aged 0-18 years with a confirmed scabies diagnosis. The primary outcomes were the cure rate at four weeks and the incidence, nature, and severity of adverse events. Data were extracted independently by two reviewers, and the methodological quality of included studies was rigorously assessed using the Cochrane Risk of Bias tool for RCTs and the Newcastle-Ottawa Scale for observational studies. Results: The search yielded 1,245 articles. Following a rigorous screening process, 22 studies met the inclusion criteria, encompassing a total of 3,890 pediatric patients from diverse geographical regions. The reported cure rates for a single application of 5% permethrin cream ranged from 78% to 98% at the four-week follow-up. Studies that implemented a protocol of a second application one week after the first consistently reported superior cure rates, frequently exceeding 95%. Adverse effects were overwhelmingly local and transient, with mild erythema, stinging, and burning sensations at the application site being the most common, occurring in less than 10% of patients. Systemic adverse reactions were exceptionally rare, and no serious long-term side effects were reported. The evidence strongly supports the safe use of permethrin in infants as young as two months old. Discussion: The synthesized evidence robustly confirms that 5% permethrin cream possesses high therapeutic efficacy and an excellent safety profile for treating scabies in children. Its neurotoxic action on the mite, combined with minimal systemic absorption and rapid metabolism in humans, underpins this favorable profile. The review underscores the critical importance of a second application to eradicate newly hatched larvae, ensuring comprehensive treatment and preventing relapse. The common phenomenon of post-scabietic pruritus was identified as a key counseling point, representing a hypersensitivity reaction rather than an active infestation or treatment failure. Conclusion: Based on extensive evidence, 5% permethrin cream remains the undisputed gold-standard treatment (toci) for scabies in children. Its high efficacy and excellent safety profile make it the treatment of choice across all pediatric age groups above two months. Optimal clinical outcomes depend on meticulous application technique, a routine two-dose regimen, and the simultaneous treatment of all household contacts to prevent re-infestation.

Keywords: Scabies, Permethrin, Pediatrics, Efficacy, Safety, Treatment, Ectoparasitic Infestations, Systematic Review.

INTRODUCTION

Scabies, an intensely pruritic skin infestation caused by the mite *Sarcoptes scabiei* var. *hominis*, represents a major global health problem, designated by the WHO as a neglected tropical disease. It disproportionately affects children, with prevalence rates in some resource-poor communities exceeding 10% (Engelman et al., 2019). The relentless itching, which characteristically worsens at night, is not caused by the mite's burrowing alone but is primarily an immunological hypersensitivity reaction to the mite, its eggs, and its fecal matter. This can severely disrupt sleep, leading to fatigue, irritability, and impaired school performance, significantly diminishing a child's quality of life.

Furthermore, the integrity of the skin barrier is compromised by both the mite's activity and the subsequent scratching. This creates a portal of entry for bacteria, notably *Streptococcus pyogenes* and *Staphylococcus aureus*, leading to secondary infections such as impetigo and cellulitis. These infections can, in turn, trigger severe, life-threatening systemic complications, including sepsis, osteomyelitis, and immune-mediated diseases like acute post-streptococcal glomerulonephritis, a major cause of preventable kidney disease in children (Romani et al., 2015). Therefore, prompt and effective treatment is a public health imperative.

A range of topical and systemic agents are available for treating scabies, including benzyl benzoate, crotamiton, sulfur, and oral ivermectin. Among them, permethrin 5% cream, a synthetic pyrethroid, has been widely endorsed by major health organizations (WHO, CDC) as the first-line therapy for scabies due to its superior efficacy and safety profile (Salavastru et al., 2017). Permethrin acts as a potent neurotoxin to the mite, causing paralysis and death by disrupting sodium transport across neuronal membranes. In humans, its safety is well-established; it is poorly absorbed through the skin (<2% of the applied dose), and any absorbed amount is rapidly metabolized by plasma esterases to inactive compounds, which are then excreted (Fawcett et al., 2022).

Despite its widespread use, questions regarding optimal application protocols (e.g., single versus double application), safety in very young infants, and the potential for emerging resistance necessitate a continuous evaluation of its effectiveness [6]. This systematic review aims to critically appraise and synthesize the available evidence from clinical studies to provide a clear, updated answer to the following questions: (1) What is the clinical efficacy of 5% permethrin cream in treating scabies in children? and (2) What is the safety and tolerability profile of 5% permethrin cream in this population, with a specific focus on infants?

METHODS

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Search strategy and study selection - A comprehensive literature search was conducted in the PubMed, Scopus, Cochrane Library, and Google Scholar databases for articles published from inception to December 2025. The search strategy combined keywords and MeSH terms: ("scabies" [MeSH Terms]) OR "*Sarcoptes scabiei*" AND (("permethrin" [MeSH Terms]) OR "permethrin") AND (("child" [MeSH Terms]) OR "pediatric" OR "infant" OR "adolescent"). The search was limited to human studies and articles published in English. Reference lists of retrieved articles were also manually screened for additional relevant studies.

Studies were included if they met the following criteria: (1) the study design was a randomized controlled trial (RCT), quasi-experimental study, prospective or retrospective cohort study, or a

case series with at least 20 pediatric patients; (2) the study population consisted of patients aged 0–18 years with scabies diagnosed by a healthcare professional (with confirmation by microscopy or dermoscopy preferred); (3) the intervention was topical 5% permethrin cream; and (4) the study reported on efficacy (cure rates) and/or safety (adverse events). Case reports, reviews without original data, editorials, and studies not focused on 5% permethrin were excluded. Two reviewers independently screened titles and abstracts, followed by a full-text review of potentially eligible articles. Disagreements were resolved through discussion with a third reviewer.

Data extraction and quality assessment - A standardized data extraction form was used to collect information, including: first author, year of publication, study design, country, sample size, age range, diagnostic criteria, permethrin application protocol (number of applications, duration of application), length of follow-up, efficacy outcomes (cure rates at specific time points), and safety outcomes (type, frequency, and severity of adverse events, categorized as local or systemic).

The methodological quality of the included RCTs was assessed using the Cochrane Risk of Bias tool (RoB 2), which evaluates bias arising from the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result. Observational studies were assessed using the Newcastle-Ottawa Scale (NOS), which evaluates patient selection, comparability of study groups, and ascertainment of outcomes.

Data synthesis - The primary efficacy outcome was the cure rate, assessed at two to four weeks after treatment initiation. Cure was defined as the complete disappearance of burrows, resolution of inflammatory lesions, and significant improvement or absence of pruritus. The primary safety outcome was the incidence of any adverse events. A narrative synthesis of the findings was performed due to significant heterogeneity in study designs, patient populations, and outcome definitions, which precluded a formal meta-analysis. Results are presented as ranges and descriptive summaries.

RESULTS

Study selection and characteristics - The initial electronic search yielded 1,245 articles. After removing 310 duplicates, 935 articles were screened. Based on title and abstract, 882 were excluded. The remaining 53 articles underwent full-text review, after which 31 were excluded. Ultimately, 22 studies met all inclusion criteria. The included studies comprised 10 RCTs, 8 prospective cohort studies, and 4 retrospective case series, representing a geographically diverse population from North America, Europe, Asia, and Australia. The total number of pediatric patients was 3,890, with ages ranging from 2 months to 17 years.

Efficacy of permethrin 5% cream - The 22 included studies reported on a total of 3,890 pediatric patients. Efficacy rates for a single, correctly applied dose of permethrin 5% cream were high, ranging from 78% to 98% at the 4-week follow-up. The majority of studies (15 out of 22) reported cure rates above 90%.

Seven studies specifically evaluated a two-application regimen (a second application 7-10 days after the first). These studies reported consistently higher cure rates, typically between 95% and 100%. For example, an RCT by Sharma and Singal (2011) found a cure rate of 98.7% with two applications of permethrin, which was significantly more effective than a single application of oral ivermectin in their study population.

In the 10 RCTs that included comparator arms, permethrin was consistently shown to be as effective as, or superior to, other common scabicides. For instance, in two RCTs comparing permethrin to oral ivermectin, permethrin demonstrated slightly higher cure rates at the 4-week mark and a significantly faster resolution of pruritus within the first two weeks.

Safety and tolerability - All 22 studies provided data on safety. Adverse events were consistently reported as mild, localized, and self-limiting. The most common adverse effect was a temporary exacerbation of pruritus, burning, or a stinging sensation immediately following application, reported in approximately 5-10% of patients. Mild contact dermatitis or erythema at the site of application was reported in fewer than 5% of cases. These symptoms typically resolved within hours and did not require discontinuation of treatment.

Crucially, no studies reported any serious systemic adverse events or signs of neurotoxicity attributable to permethrin. The safety profile was consistent across all pediatric age groups. Four studies that specifically included infants as young as two months of age found no increase in the frequency or severity of adverse effects in this subgroup compared to older children, providing strong evidence to support regulatory recommendations for its use in young infants.

DISCUSSION

This systematic review consolidates evidence from over three decades of clinical research, confirming that 5% permethrin cream is a highly effective and safe treatment for scabies in children.

Interpretation of efficacy findings - The potent scabicide activity of permethrin is demonstrated by the high cure rates observed across multiple study designs and populations. The observed variability in efficacy (78-98%) is likely attributable to factors such as patient adherence and application technique rather than drug failure. Incomplete application, particularly missing key areas like the scalp and face in infants, interdigital webs, and subungual areas, is a primary cause of treatment failure. This underscores the importance of clear and detailed instructions for caregivers.

The review highlights a critical clinical point: the superiority of a two-dose regimen. A single application kills active mites but may not be fully ovicidal. A second application 7-10 days later is timed to eradicate newly hatched larvae before they mature and lay new eggs, thus breaking the mite's life cycle and minimizing the risk of relapse [7]. This two-dose regimen should be considered the standard of care.

Interpretation of safety findings - The safety profile of permethrin is excellent and is a key reason for its first-line status. The low incidence of adverse events, almost exclusively mild and localized, is a significant advantage in children. This is explained by the drug's favorable pharmacokinetics, with minimal systemic absorption and rapid inactivation of any absorbed amount. The absence of reported systemic toxicity in thousands of children provides strong reassurance of its safety, even in infants over two months of age.

Clinicians and caregivers must be educated about post-scabietic pruritus. This persistent itch, lasting for weeks after successful mite eradication, is an immunological phenomenon and does not signify treatment failure. Counseling families about this possibility is crucial to prevent unnecessary and potentially harmful re-treatment. Management should focus on emollients, cool baths, and short-term oral antihistamines.

Implications for Clinical Practice and Future Research - For clinicians, the key takeaways are: (1) confidently prescribe 5% permethrin cream as the first-line agent for children >2 months old; (2) strongly recommend a two-application protocol; (3) provide meticulous instructions on application, emphasizing full-body coverage; and (4) stress the absolute necessity of treating all household members and close contacts simultaneously, regardless of symptoms, to prevent re-infestation.

Future research should focus on several areas. First, studies on the efficacy and safety of permethrin in infants under two months are still needed. Second, continued surveillance for permethrin resistance is warranted, although it remains rare. Finally, research into novel

scabicides and community-wide mass drug administration strategies is essential for global scabies control.

This review has some limitations. There was heterogeneity among studies in design and outcome assessment, which precluded a meta-analysis. The review was limited to English-language publications, potentially introducing a language bias. Finally, there may be a publication bias, as studies with positive findings are more likely to be published.

CONCLUSION

The evidence synthesized in this systematic review robustly supports the use of 5% permethrin cream as the gold-standard treatment for scabies in the pediatric population. It demonstrates high efficacy, especially when a two-dose regimen is employed, and an outstanding safety profile across all pediatric age groups above two months. To achieve successful eradication and prevent the cycle of re-infestation, clinical practice must prioritize thorough patient and family education on proper application, the importance of the second dose, and the necessity of treating all contacts.

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