

# Review Article:

## Scabies Treatment in Children: A Narrative Review




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## ABSTRACT

**Context:** Scabies is a common infestation in children. Treatment of scabies in infants and children is a therapeutic challenge. Many prescribed drugs for adults cannot be used in children because of their side effects and safety profile. This review article studied the treatment of scabies in children and infants.

**Evidence Acquisition:** In this review, electronic databases, including Google Scholar, PubMed, Cochrane and Scopus were searched based on the following MeSH terms: Scabies, Pediatric and Children. We included all articles related to scabies in children published from 2008 to 2018. Duplicated and irrelevant studies and abstracts were excluded.

**Results:** The management of scabies is focused on identification and treatment of cases and household contacts. We briefly discussed the clinical presentation of scabies with the currently used topical and oral treatments for this infestation. Topical treatments are effective and the most effective treatment is permethrin. Other treatment options may be less effective, poorly tolerated, or with adverse effects.

**Conclusions:** Scabies is prevalent in children and causes considerable morbidity. Because of its complications, scabies should be managed properly in accordance with the guidelines.

## 1. Context

Scabies is an intensely itchy dermatosis caused by the mite *Sarcoptes scabiei*. The infestation can occur at all ages but particularly occurs in children (1-4). Scabies is most prevalent in children under 2 years old (5, 6). Children in developing countries are most susceptible for it, with an average prevalence of 5%-10% (4). The most common

source of transmission is prolonged skin-to-skin contact with an infected individual. Mites in the epidermis are resistant to water and soap, and continue viability even after daily hot baths (7, 8).

Infants and children are particularly liable to infection from close physical contact with other children and adults. Predisposing factors of scabies include overcrowding, poor hygiene, poor nutritional status, homelessness.

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Poverty and overcrowding are the main risk factors for it, and scabies outbreaks are prevalent in institutions and refugee camps (5, 9).

Scabies is typically presented with a generalized pruritic rash, worsening at night (10-12). The clinical presentation of scabies varies according to age. Relapse, the presence of nodules and involvement of soles and scalp are independently associated with the age group of <2 years. Patients aged 2 to 15 years are more at risk for relapse, with more frequent shared pruritus and involvement of soles and scalp. The face, ankles and foot, soles, head and neck, and scalp were almost exclusively involved in patients aged <15 years (13, 14). Nodules were commonly located in axillary and back areas in infants. Palmoplantar lesions were more frequently observed in infants, with sole involvement being more frequent than palm involvement in children and infants (13, 14).

The dorsum of the forefoot is rarely involved in infants and must be assessed during physical examination. Perungual involvement was detected in infants and children. The involvement of the lower limbs revealed an increasing gradient according to age; lower limbs are frequently involved in infants. Face involvement was only found in children and infants. Boralevi et al. found that approximately 20% of infants and children mainly showed daytime pruritus (13). Crusted scabies or Norwegian scabies is a severe infestation with thousands of mites, associated with extremely high risk of contagion which causes considerable morbidity (15-18).

Clinical diagnosis is based on identifying burrows in the skin coupled with clinical features like itching in other members of the family, itching that is worse at night, and the anatomical distribution of lesions (19). Differential diagnosis are papular urticaria, lichen planus, atopic eczema, acropustulosis of infancy, and dermatitis herpetiformis.

Atopic eczema is frequently mistaken for scabies. This disease is characterized by itching and vesicopapular eruption predominantly in the flexors. Scabies can be differentiated by the presence of burrows, web space involvement and exacerbation with topical steroids. Infestation is complicated by bacterial skin infections including impetigo, cellulitis, abscess and acute post streptococcal glomerulonephritis; lymphangitis and septicemia have also been reported in crusted scabies (14, 19-22).

Treatment of scabies in infants and children is a unique challenge, and the manifestations of scabies are different in children. Many prescribed drugs for adults cannot be

used in children because of their side effects and safety profile. The current review article studied the most appropriate treatment for scabies in children and infants.

## 2. Evidence Acquisition

In this review, electronic databases, including Google Scholar, PubMed, Cochrane and Scopus were searched. We conducted a review of articles published on pediatric scabies with the following MeSH terms: "Scabies", "Pediatric", and "Children" from 2008 to 2018. Additional articles were also included by manual search without any time limitation by the following keywords: "Scabies in children", "pediatrics", "infants", "neonates", "crusted scabies", "management", and "treatment". We included all published data on the association of scabies, then selected all studies on scabies infestation in children (67 articles). All studies were either case-control, cross-sectional, clinical trials, or review articles on scabies infestation in children and its management. Duplicated and irrelevant studies and abstracts were excluded from the review.

## 3. Results

Current management of scabies is focused on identification and treatment of cases and household contacts.

### 3.1. Topical agents

Topical treatments are low compliance among household contacts. This problem may reduce the effectiveness of topical treatment, leading to reinfestation (23). Children should be provided with aqueous preparations because alcoholic lotions sting and can cause wheeze. Its application should be extended to the scalp, neck, face, and ears, in under 2 years old and immunocompromised people.

The agent should be applied to the entire skin surface with special attention to fingers and toes creases, cleft of the buttocks and beneath the fingernails and toenails, avoiding the eyes, mouth, and areas of non-intact skin, for the specified period, then completely washed off. Application to the head is important in children. Absorption is higher in infants and children, and the agent should not be applied to warm or wet skin after a bath (24). A second course of treatment is often recommended for topical agent, 7-10 days later because of some developing larvae that may survive after the initial course of treatment (25).

### 3.1.1. Permethrin

Permethrin is a synthetic pyrethroid agent, used for the treatment of scabies. Permethrin is scabidical and ovicidal (26, 27). Therefore, it is highly effective after a single application. This agent disrupts the function of voltage-gated sodium channels of arthropods, causing prolonged depolarization of nerve-cell membranes and disrupting neurotransmission (28).

Permethrin is generally considered to be safe for younger children. However, this agent might have neurological complications. Therefore, some advocate a shorter application time in infants aged <2 months. In the USA, permethrin is only approved for infants aged >2 months. With regard to theoretical concerns about systemic absorption of permethrin in neonate, it has generally been recommended that neonates be treated with crotamiton or a sulfur preparation instead of permethrin. However, given the efficacy of permethrin, it is increasingly being used in 2 months old or older babies (2). Its 5% cream must be applied overnight (8-14 h), then washed off. Potential mechanisms for resistance to permethrin include sodium-channel mutations in the organism that make it less susceptible to treatment (29, 30).

### 3.1.2. Sulfur

Sulfur-containing preparations can also be used in infants and young children. Sulfur compounds have been used for centuries. Ointments are the only products available in some regions, but not recommended as first-line agents. These preparations are effective in outbreaks. Precipitated ointments are often poorly accepted, because they are messy and malodorous, and can stain clothes and cause skin irritation. In general, 5%-10% of ointments must be applied for 24 h, then washed and reapplied for 3 days (31).

### 3.1.3. Benzyl benzoate

This is the most widely used substance in developing countries. Adverse effects of benzyl benzoate 25% lotion are transient skin irritation and burning immediately after application. Neurological complications are possible with benzyl benzoate. To reduce irritation, benzyl benzoate should be diluted to 12.5% for children and to 6.25% for infants. However, dilution reduces its efficacy. Clinical trials recognized oral ivermectin as equally or more effective than benzyl benzoate. Benzyl benzoate is irritant, not used in children under 2 years old. It must

be applied on skin for 24 hours for 2-3 days with baths taken between each application (32-34).

### 3.1.4. Malathion 0.5%

This agent is a cholinesterase inhibitor and not used in the UK. However, it is seldom used in other parts of the world. It is prescribed for children over 6 months. The aqueous preparation is preferred because the alcohol preparation stings broken skin and is flammable. It is applied to skin and then wash off after 24 hours (35, 36).

### 3.1.5. Crotamiton 10%

This cream is a safe alternative for infants, but requires multiple treatments. It is used in all ages. It must be applied on skin for 24 hours, then washed and reapplied for 3-5 days (35).

### 3.1.6. Gamma benzene hexachloride (Lindane) 1%

Lindane has been withdrawn from many countries, and is now a second-line treatment in developed countries. It continues to be used in many tropical and developing countries, because it is cheap and effective. Systemic absorption is greater than permethrin or crotamiton. There are reports of aplastic anemia and neurological complications, including convulsions. The greatest risks are for infants, pregnant women, and those with neurological disorders. It is contraindicated in children younger than 3 years and is considered, at least in the USA, as only a second-line drug due to high toxicity and increasing resistance (37). Evidence of resistance and treatment failures with Lindane have been reported (38). It is applied on skin for 8 h, then wash off.

### 3.1.7. Topical ivermectin

Topical ivermectin 1% lotion is effective in the treatment of scabies. Studies disregarded pediatric specific problems that would limit the usefulness of ivermectin topical cream in pediatric population. However, it is not recommended in infants younger than 6 months of age. Topical ivermectin is not ovicidal, but very effective on adult mites. Application of ivermectin was as effective as permethrin 2.5% cream, at a 2-week follow-up (39).

## 3.2. Oral or systemic agents

### 3.2.1. Ivermectin

Oral ivermectin has shown great promise in scabies treatment (40), particularly for crusted scabies, bullous scabies, nodular scabies, infestation in immuno-

compromised hosts, institutional outbreaks, and mass administration in highly endemic communities (41, 42). This agent is a semisynthetic macrocyclic lactone antibiotic. It disrupts the function of a class of ligand-gated chloride ion channels, causing persistent opening of the channels (43, 44). However, the target of this drug in the scabies mite remains undiscovered and a pH-gated chloride channel, sensitive to ivermectin has been suggested (45). Ly et al. reported a higher rate of treatment failure with single-dose ivermectin than with topical benzyl benzoate (46).

The use of ivermectin to treat scabies has not been associated with any serious adverse effects; further data are required regarding the use of ivermectin in children weighted <15 kg or aged younger than 5 years. Therefore, ivermectin is not recommended in these groups. Ivermectin is a substrate for the cytochrome P450 3A4 pathway, and caution should be exercised in people taking medications that induce or inhibit this pathway. Ivermectin limits ovicidal activity, thus repeating the treatment is recommended after 1-2 weeks, with oral dose of 200 µ/kg. Food ingestion increases the bioavailability of ivermectin. Adjustment of the dose is not necessary in patients with renal impairment (47).

### 3.2.2. Albendazole

Benzimidazoles such as albendazole inhibit the polymerization of tubulin and the microtubule-dependent glucose uptake by binding to free tubulin, leading to parasitic death. This agent may interfere with the synaptic transmission of parasites through a probable cholinergic effect. Ayoub et al. applied oral albendazole and suggested that this agent provides a potential therapeutic option for scabies (48). Douri et al. treated crusted scabies with albendazole (49). There is no study on the efficacy and safety of albendazole in children with scabies.

### 3.3. Other

Environmental controls for scabies include washing sheets and clothing at 60°C and drying in a hot dryer. Isolation in a plastic bag for at least 72 hours is sufficient for items that cannot be machine washed. Other environmental controls such as pesticide sprays or powders are not recommended. It is important to treat the mothers of infected infants. All family members and close contacts should be treated simultaneously because of the common occurrence of asymptomatic mite carriers in the household. Living mites have been found in dust samples on floors and furniture, particularly in patients with crusted scabies (22, 50, 51).

With due attention to complications, treatment is important in all cases and should be provided for all household contacts, in order to prevent spread. Removal of the crust is important in crusted scabies. Studies in Northern Australia suggest a regimen of multiple doses of oral ivermectin with repeated topical permethrin and keratolytic therapy (15, 52).

Studies indicate that clinical cases (as mentioned above) should be treated and treatment of all potentially exposed residents, staff, and visitors is mandatory (e.g. kindergartens), to manage institutional outbreak of scabies. A single application of topical permethrin 5% applied in the evening and left on overnight suffices for prevention matters (53-60). A few days after initiation of therapy, transient exacerbation of pruritus occurs as a result of sensitization of the human host to mite antigens, because of immunologic reaction. Emollient, antihistamines and topical steroids can be used for symptomatic relief of pruritus. Topical, intralesional, or systemic corticosteroid therapy can be considered for persons with nodular scabies who have persistent symptoms (61, 62).

Treatment of secondary bacterial infection is important. The rash and itch may persist for up to 2-4 weeks after a successful treatment (2). Novel treatments based on herbal compounds, tea tree oil, eugenol compounds, TOTO soap and Lippie oil have the potential for such treatment (2, 47, 63-65). Two case reports about the treatment of nodular scabies and post scabies itching with tacrolimus and pimecrolimus were documented by Mittal and Almeida et al. (66, 67).

## 4. Conclusions

*Sarcoptes scabiei* cannot survive without human beings. Scabies is frequent in children and causes considerable morbidity. It imposes distress to children and their families, and its treatment is very costly. Scabies should be managed properly in accordance with the guidelines, because of its complications, like acute poststreptococcal glomerulonephritis. Further studies are required to develop appropriate regimens for children with scabies using different agents.

## Ethical Considerations

### Compliance with ethical guidelines

There is no ethical principle to be considered doing this research.

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### Authors contributions

All authors contributed equally in all steps of the present study.

### Conflict of interest

The authors declare no conflict of interest.

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