Current Practice

Diagnosis and management of scabies in children

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Introduction

Human scabies is a common parasitic infestation caused by the mite *Sarcoptes scabiei*[1]. It is also recognized as 'itch mite' since it causes severe pruritus[2]. Although it is a minor infection, consequences of this infestation lead to significant distress in patients and their families. When the infection roots in the epidermis following burrowing of mites and creates skin excoriation, the initial sites of infection provide a route of entry for pathogenic bacteria which include *Streptococcus pyogenes* and *Staphylococcus aureus*[3]. These secondary bacterial infections cause significant unseen morbidity.

Although the exact figures of worldwide occurrence of scabies is not known, it is stated that over 200 million patients are infected by scabies[1]. In industrialized countries, epidemics of scabies have been common in residential and nursing homes[4] whereas in developing countries, it is almost endemic due to resource limited environments, overcrowding and poor hygienic practices. Scabies has been described in prehistoric scripts in China, India and the Middle-East[5]. Similar to any other infectious disease, it has been spreading by direct-contact in overcrowded environments and children living with poverty and inadequate infrastructure facilities are especially at high risk[2]. Therefore, it can be regarded as a disease of poor personal hygiene. The prevalence is also high in over-congested communities[2]. Perhaps the transmission of secondary bacterial infections is also related to poor hygiene[4].

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Pathogenesis

The primary infection occurs after 3-6 weeks of an incubation period whereas the incubation period could be as short as 1-2 days during re-infections[3]. Symptoms mostly result from host sensitivity and by direct invasion of mites[2]. This sensitization begins a month after primary infection and persists for as long as 6 weeks till the symptoms of hypersensitivity resolve[6].

Clinical Presentation

Infection due to the scabies mite classically presents with extremely itchy skin lesions comprising papules, nodules and vesicles[3]. It has a predilection to certain areas of the body such as interdigital areas, wrists, anterior axillary folds, peri-umbilical skin, buttocks, ankles, penis, and peri-areolar region[2]. Palms, soles, face, neck and scalp are also affected in infants[3]. These lesions are more itchy during the night than during daytime[7].

There are two types of skin eruptions identified and they include erythematous papular and vesicular lesions[2]. The skin eruptions are linked with burrows made by the adult female following consumption of the epidermis. Burrows are the pathognomonic clinical feature of scabies infestation[2]. They occur as creeping greyish lines, nearly 5mm long and are seldom detectible with the unassisted eye[2]. Further, they become mostly undetectable because of damaged skin caused by rubbing, crusting and also by secondary bacterial infection. Therefore, burrows might be identified only in a few cases[8]. With chronic infection, severe eczematous changes in skin form "scabies nodules" in male genitalia and breasts in girls[2]. Even though effective treatment is available, children in endemic areas are prone to get reinfection even after household contacts have been fully treated[9].

Scabies Incognito
This refers to the uncharacteristic appearance of scabies in patients who have secondary bacterial infections and longstanding scabies infection in which eczematous changes complicate the classical clinical appearance[2].

Crusted scabies
Patients with immunocompromised states such as being on steroids or chemotherapy, human immunodeficiency virus (HIV) infection and malignancy can present with an atypical presentation called crusted scabies (also called Norwegian scabies) where hyper-infestation occurs with millions of mites[10]. This is different from classic scabies where only 10 to 15 mites are involved. Crusted scabies involves deep skin fissures of palms and soles and form hyperkeratotic dermatosis which is associated with generalized lymphadenopathy, blood eosinophilia[11] and increased serum IgE[12]. Crusted scabies can coexist with secondary bacterial infections which account for significant morbidity[13]. A novel clinical grading scale for crusted scabies was designed by Davis *et al.*[14] to evaluate the severity of disease and guide management. The score is based on the clinical evaluation of four fields: distribution and extent of disease, severity or depth of skin crusting, the number of past occurrence (hospitalizations) for crusted scabies and degree of skin cracking and pyoderma. Each field is scored between 1 (mild) and 3 (severe) and the cumulative score produces an overall grade: grade 1 (score 4-6), grade 2 (score 7-9), and grade 3 (score10-12).

Immune manifestations of scabies
Streptococcal pyogenes secondary to scabies is a key risk factor for acute post-streptococcal glomerulonephritis[15]. Complications of scabies are illustrated in Figure 1.

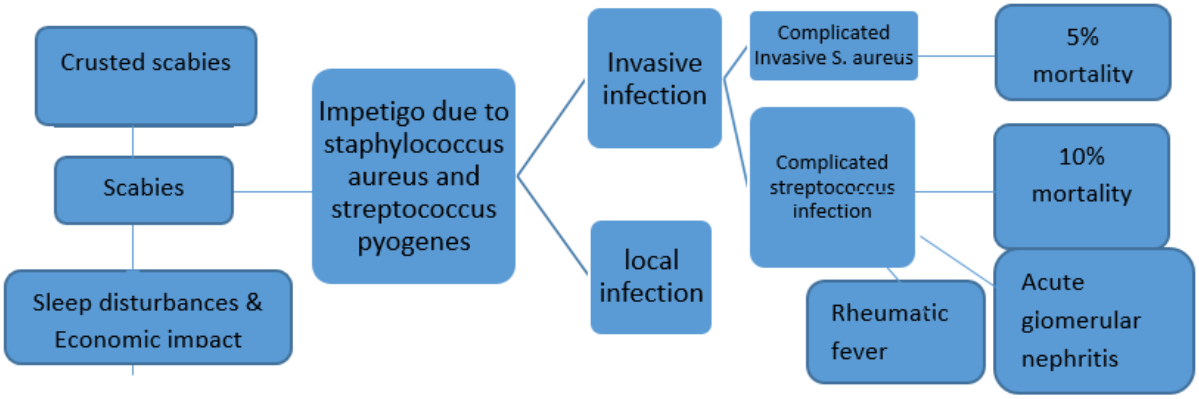

Figure -1 ***Complications of scabies infestation***

Diagnosis
Scabies can be suspected based on the presenting clinical features. The narrative symptoms include extremely pruritic skin rash, which frequently gets worse at night and also disturbs sleep. Parents often report having scabies in other family members. Physical examination may disclose skin lesions which have a characteristic distribution and serpiginous burrows that may be detectable with the unaided eye.

Dermatoscopy evaluation
Dermatoscopy permits visualization of the wavy scaly burrows[16]. Mites and eggs may also be detected within burrows. The appearance of the mite within a burrow is described as a dark triangular structure which consists of a pigmented head and anterior legs. This is known as a "jet with contrail" appearance[3]. Further, a "mini triangle" sign might appear in the burrow as head of the developing mite is visible inside the egg[16].

Novel diagnostic methods
There is no consistent and reliable laboratory test to diagnose scabies. A variety of antigen and antibody immunoassays, conventional PCR immunoassays, and conventional PCR directing mitochondrial cytochrome c oxidase subunit 1 (cox1) gene of *Sarcoptes scabiei* have been used although with limited success[17].

Criteria for the diagnosis of scabies according to 2018 International Association of Classification Societies (IACS)
Currently accepted well-known criteria for diagnosis of scabies, proposed by the newest Delphi study

linking worldwide professionals, have a high degree of sensitivity (>89%)[18]. There are three categories of diagnosis viz. "confirmed scabies", "clinical scabies" and "suspected scabies". Each of this has its identifiable fixed criteria equivalent to the level of diagnostic inevitability. The diagnosis of "confirmed scabies" entails direct visualization of either mite or mite products like eggs and faeces by at least one of these methods including microscopy, dermatoscopy and video-dermoscopy. The diagnosis of "clinical scabies" and "suspected scabies" depends on the identification of typical skin lesions in a specific distribution reinforced by the main features in the history (Table 1). These criteria may aid health workers to diagnose scabies and compare its prevalence in the community and in research settings.

Table 1*: Summary of 2018 IACS criteria for the diagnosis of scabies*[18]

Criterion	Diagnostic features
A: Confirmed scabies	*At least one of:* A1: Mites, eggs, or faeces on light microscopy of skin samples A2: Mites, eggs, faeces visualized on individual using high-powered imaging device A3: Mites visualized on individual using dermoscopy
B: Clinical scabies	*At least one of:* B1: Scabies burrows B2: Typical lesions affecting male genitalia B3: Typical lesions in a typical distribution and two history features
C: Suspected scabies	*One of:* C1: Typical lesion in a typical distribution and one history feature C2: Atypical lesion or atypical distribution and two history features
History features	H1: Itchy rash H2: Close contact with individuals who has itch or typical lesions in a typical distribution

Differential diagnosis

The differential diagnoses for scabies include both itchy dermatological conditions (atopic dermatitis, psoriasis) and blistering diseases such as bullous pemphigoid[19]. The rash of Langerhan cell histiocytosis also mimics scabies eruption[20]. Seborrhoeic dermatitis and psoriasis are differential diagnoses of crusted scabies[21].

Treatment

Both topical and systemic treatments are available for scabies, but there are only a few clinical studies which compared the relative effectiveness of these treatments, especially topical agents[22]. This is the reason why treatment among countries depends on the availability of drugs, cost-benefit ratio and personal practice by clinicians. Management of scabies depends on the diagnostic ability of the clinician along with exclusion of other possible differential diagnoses. The main treatment for scabies is by topically active substances such as permethrin (a synthetic pyrethroid insecticide), sulphur compounds and benzyl benzoate[2]. Complete response to treatment has been achieved in 6 weeks provided the patient follows adequate treatment with good compliance[3]. This is because resolution of hypersensitivity takes a long time.

Permethrin

Permethrin disrupts neurotransmission of scabies[23]. Permethrin 5% cream is well tolerated[24] and highly effective[25] with a single application as it acts against adult parasites and eggs of scabies mite. Cream needs to be used over the whole body other than the eyes. It is commonly applied in the evening and left overnight. An additional dose might be necessary in 1-2 weeks following the first application to eradicate all the mites[23]. Adverse reactions are very rare except for local erythema, burning sensations and pruritus[26].

Sulphur compounds

5–10% sulphur in paraffin would be effective in scabies and has been used in most countries[27] although it is poorly tolerated due to its unpleasant smell and risk of skin irritation. Both Permethrin and sulphur are effective in young children[28].

Benzyl benzoate

Benzyl benzoate is a rapidly acting highly effective anti-scabietic drug[3]. It is an ester of benzoic acid and benzyl alcohol and has been used in 10–25% preparations in many countries. It is recommended that applications are left for 24 hours following topical administration[2]. It has high cure rates in those who tolerate the drug well. The main side effect is skin irritation which might cause a painful burning

sensation and warrant washing off the application[2]. Repeated use might reduce skin irritation[3].

Gamma benzene hexachloride
Although gamma benzene hexachloride (Lindane) was effective in treating scabies, the drug was withdrawn from the market due to increased risk of neurotoxic side effects. Seizures, restlessness, and tremors are the reported neurotoxic effects[29].

Crotamiton
10% Crotamiton is the preferred treatment for children given its low toxicity profile; however, several applications are generally needed to cure scabies[29].

Ivermectin
Ivermectin is an alternative treatment option to 5% permethrin and it is tolerated well by most children when given orally[24]; however it is not ovicidal, and a repeat dose is recommended in 2 weeks to eradicate newly hatched mites. The success rates are equivalent to that of permethrin[24]. Although oral ivermectin was accessible commercially for years, it is not licensed for use in the United Kingdom except for crusted scabies. However, ivermectin has been approved in many countries including Germany, Japan, Australia, the Netherlands and New Zealand[24]. In India, oral ivermectin is extensively used as it is freely available and less expensive than permethrin[30]. Oral ivermectin has a proven safety profile[31] in mass drug administration (MDA), but is recommended for children over 5 years of age due to lack of data on efficacy below the age of 5 years. Use of ivermectin at community level has reduced prevalence of scabies in two studies[31,32].

Treatment of crusted scabies
Ivermectin multiple dose therapy is recommended for crusted scabies. Grade 1 lesions need community care with ivermectin 3 doses a week, grade 2 and 3 requiring hospitalization with variable doses of ivermectin combined with topical treatment, in addition to treatment of secondary bacterial infection and hyperkeratosis[14]. Furthermore, all household and close contacts related to crusted scabies should be given treatment.

Novel therapies
Due to evolving resistance to presently existing medications, there is a demand for novel drugs and a vaccine against scabies. Moxidectin is an innovative drug which provides superior results over ivermectin due to its long half-life and can be given as a single dose[33].

Persistent symptoms[2]
Some patients have persistent symptoms even after two weeks of curative treatment. Box 1 shows differential causes for persistent symptoms.

Box 1: Reasons for persistent symptoms following treatment for scabies

- Inaccurate initial diagnosis.
- Persistent hypersensitivity to mites
- Development of eczema.
- Sensitization to topical acaricides.
- Reinfection
- Inaccurate use of the acaricides.
- Insufficient permeation of topical preparations.
- Drug resistance.

Control of scabies
Control and prevention of scabies need a multidisciplinary approach. The World Health Organization (WHO) has recognized scabies as a neglected tropical disease (NTD). Further research is required to design novel cost-effective and less invasive diagnostic tests and upgrade treatment and control approaches. International Alliance for the Control of Scabies (IACS) is another global movement dedicated to overcoming challenges of control of scabies[34]. Scabies should be recognised as a public health concern in endemic regions and active case surveillance must be performed. Mass drug administration as a preventive strategy in highly endemic regions has been justified by some studies[35].

Conclusion
Although human scabies responds to treatment, the disease continues to spread causing a significant reduction of quality of life in affected patients. Further, it increases morbidity and mortality due to secondary bacterial infection. Intense control is an immediate requirement.

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